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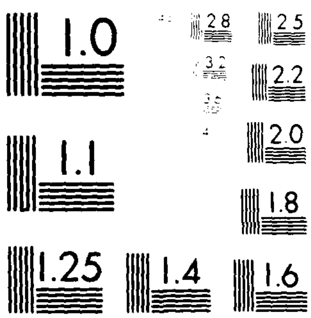

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A USER'S GUIDE FOR LOGATAK

A Simulation Model to Analyze Logistic Network Distribution and Interdiction

BDM Corporation
7915 Jones Branch Drive
McLean, Virginia 22102

15 April 1981

Handbook

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This user's guide describes the LOGATAK computer simulation model and its applications. The model is a transportation network simulation by which logistics and combat forces are moved throughout a theater of operations. Interdiction strategies are tested using the model to determine vulnerabilities in the transportation system and evaluate the effectiveness of interdiction against forces and resupply. The model was originally developed in 1977 by the BDM Corporation based on the MAWLOGS (Model of the

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20. ABSTRACT (Continued)

Army Worldwide Logistics) modeling system. Since then, a number of improvements and enhanced capabilities have been made, resulting in an effective interdiction analysis tool.

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CHAPTER I
GENERAL DESCRIPTION

This document is a user's guide to the LOGATAK simulation model and the DAMSEL data base program. The first chapter provides a general description of the programs and their uses. The second chapter describes how a user specifies a particular scenario which will be used in the model analysis. Chapter III describes the DAMSEL data management and selection program in detail. Chapter IV describes the input data for the LOGATAK model, including deck structures and card formats. The reports produced by the LOGATAK model are described and examples are shown in Chapter V. The operating strategy for running the model and analyzing the results is discussed in Chapter VI. Chapter VII treats expanded force movement and interdiction options.

1. PURPOSE AND USE

1.1 LOGATAK

The LOGATAK simulation model was developed to assess the impact of interdiction on a logistic network and to aid in developing attack strategies on the network. The model represents a multi-echelon supply system connected by a multi-mode transportation network. The movement of shipments throughout the network is simulated over time to permit the analysis of traffic flows and overloads. The model utilizes the available transportation capability to move all shipments and chooses alternate routes if overloads or attacks reduce the capability.

The model was designed to handle a wide range of scenarios and transportation networks. The user can select any geographic area that is covered by the data base and specify the location of supply bases and the movement of units over the area selected. Varying demand patterns may be specified to represent changing conditions on the battlefield. The demands from units in different locations drive the model to satisfy the movement requirements over the transportation network.

The normal mode of operation for the LOGATAK model is a baseline run during which no interdiction is performed, followed by a series of runs to test various attack strategies. A comparative analysis can then be performed on the system response under varying conditions. The model also includes a target allocation algorithm (TARGAA) which aids in determining preferred attack strategies.

1.2 DAMSEL

Program DAMSEL was developed as an effective means of data management and data selection. It serves as an interface between the logistical data base and the LOGATAK simulation model. It performs this function in both directions, i.e., taking data from the data library and converting to the proper formats for LOGATAK, and by providing convenient printed output enabling the analyst to reference the LOGATAK results back to the logistical data base.

In its role as data manager, program DAMSEL performs four basic tasks: *(1) adds, (2) deletes, (3) updates and (4) orders.* The program can add new data to or delete data from the library. DAMSEL also has the capability of updating one or more variables of a particular data entry in the library. These three tasks are all carried out while keeping the data ordered according to a specified arrangement. The ordering of the data in the library enables DAMSEL to operate more efficiently in selecting sections of data for analysis.

The other main function of DAMSEL is to select data from the data library as requested by the analyst. Because the data library can be quite extensive, and because computer core restrictions limit the amount of data which can fit into the machine with LOGATAK, it becomes necessary to select only the data which is pertinent to the analysis being performed. Once the appropriate data has been selected from the data library it is transformed into the proper format for LOGATAK. This data, ready for use by LOGATAK, is stored on a permanent file. The printed output of DAMSEL provides a cross-reference between the logistic data base entries and their corresponding LOGATAK format.

2. GENERAL CHARACTERISTICS

2.1 LOGATAK

The LOGATAK model is a discrete-event, stochastic simulation model consisting of supply demand generator nodes, intermediate stockage points, supply source nodes, and a multi-mode transportation network connecting these nodes. The flow of shipments in response to demands from the supply nodes is simulated over time on the transportation network. Overload of the transportation network causes queue buildups and rerouting of shipments. Losses and impairments in the network due to attack at any time create similar effects, thus hampering the transportation system's ability to respond to the demands. The basic measures of effectiveness in the model are: the percent of materiel demanded which is received, the response time experienced, the intermediate inventory levels, and the resource utilization and workloads in the transportation network.

Figure I-1 shows the basic inputs and outputs for the model. The user defines the transportation network (with the help of DAMSEL), the scenario, and the initial stockage levels. The model is then run and transportation workloads and demand satisfaction are reported. Optional attacks can be specified by the user or by TARGAA to disrupt the network and effect the outcome. A general description of LOGATAK inputs and outputs is given in Table I-1. A complete specification is provided in Chapters IV and V.

The model is a sophisticated simulation model with complex logic to handle the many decisions arising from traffic routing and overload rerouting. The model enables the user to study the interactions between many shipments in a multi-mode transportation network under a wide range of conditions. In addition, conditions in the network can be altered during the model run by such outside forces as attacks and weather. The model then adjusts to the new conditions and the traffic flow during the transition period can be studied.

The model program is written in the FORTRAN language and is currently operational on a Control Data Corporation CYBER 73 computer

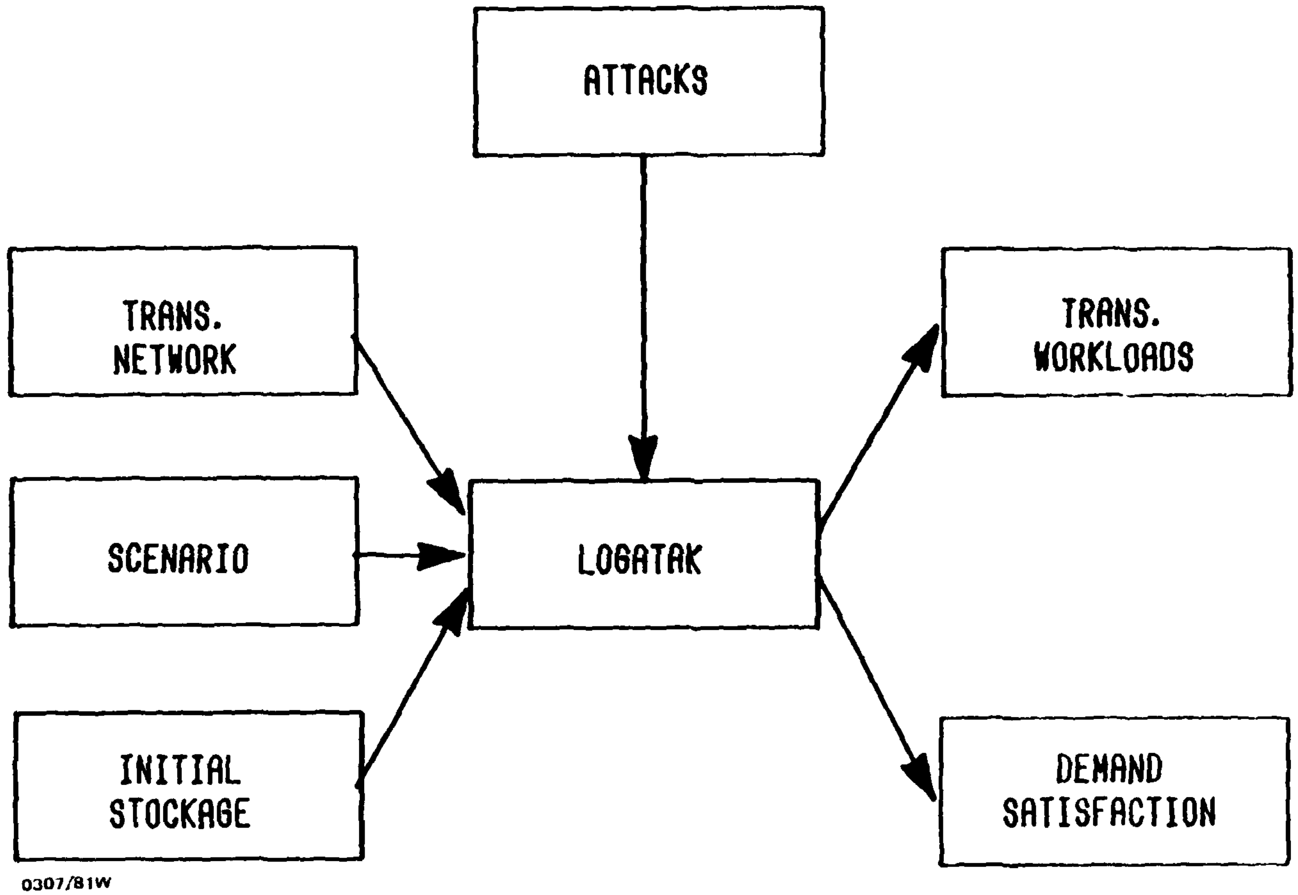

Figure I-1. LOGATAK Simulation Model

TABLE I-1. LOGATAK MODEL

INPUTS	OUTPUTS
• NETWORK DESCRIPTION LINK AND TERMINAL SPECS MODE LENGTH RATE OF TRAVEL CAPACITY TIME TO REBUILD • SCENARIO TIME PHASED DEMANDS LOCATION OF DIVISIONS PRIORITY OF DIVISIONS • INITIAL STOCKAGE AT SUPPLY POINTS • ATTACKS WHERE WHEN	• SUPPLY STATUS BY NODE/CLASS QUANTITY ORDERED QUANTITY RECEIVED QUANTITY DUE-IN DURATION OF DUE-INS • TRANSPORTATION STATUS NETWORK CHARACTERISTICS NETWORK WORKLOADS FOR EACH LINK/TERMINAL AVERAGE LOAD PEAK LOAD TOTAL THRUPUT QUEUE BUILDUPS • ATTACK RESULTS

system (equivalent to the large CDC 6000 series computers). The program is a dynamic simulation model that can handle data changes during execution. The model has a restart capability so that a run may be stopped at any time and restarted from that point in simulation time after analysis of the output. The model also has event trace and transaction file capabilities. The trace allows the user to verify that the logical decisions are being made properly within the model. The transaction file permits post-model run analysis and graphing of the results.

2.2 DAMSEL

Program DAMSEL was developed in order to provide a smooth transition between the data base and the LOGATAK simulation. It was first considered only as a tool to ease in formatting the data for use in LOGATAK; however, its greatest task became that of managing the data base itself. Because of the size of the data base and the limitations of core requirements from LOGATAK, only portions of the data base could be utilized at any one time. Therefore it was necessary to have a means of "selecting" segments of data from the full data base to provide input for a LOGATAK investigation. DAMSEL was developed as a preprocessor program for the logistics data base.

It was determined early on that some trade offs were necessary between data base and LOGATAK because of computer size and core restrictions. The result of one trade off was the sectoring of data. Because of this trade a preprocessing program was needed to convert data from its map/sector form to the proper LOGATAK format and numbering sequence.

DAMSEL is written in FORTRAN IV in modular form. The subroutines represent the major operations of the simulation, namely, data management and data selection. The main (or executive) program acts as controller setting the proper conditions and calling the appropriate operations.

The heart of the program is the data base library and manipulations of same. To ease the data selection process discussed previously the data library is ordered with respect to coded data identification numbers. This order must be maintained whenever a new data library is created. To accomplish this, changes to the data base must be presorted and submitted in proper order. This presort requirement eases programming operations and eliminates the need for numerous passes through the data library file.

The program requires as many as eight input/output files depending upon what functions are being performed. Two files are utilized for the data library. Four files are needed for the select function including two working files and two output files to feed LOGATAK. The remaining files are the basic input and output to the program.

The entire DAMSEL program consists of approximately 600 statements. Its compilation time is less than ten seconds on a CDC 6000 Series Computer utilizing 18,000 words of core.

3. ACTIVITIES SIMULATED

3.1 Supply Structure

The supply users in the model are simulated as nodes representing military units or aggregations of units which generate demands for various classes of supply over time (based on the scenario being modeled). Intermediate stockage points in the model receive demands from the user nodes and either fill the demands from inventory or pass the demands to a higher echelon. These stockage points maintain inventory levels by ordering replenishments from a higher echelon. The source of materiel in the model is represented by nodes that fill all demands from the lower echelon supply nodes. Fill delays may be represented at these nodes to indicate backorders and stock availability problems.

One or more supply classes may be represented at each supply node in the model. There is no fixed maximum on the number of classes of materiel other than computer core storage limitations. Example supply classes are ammunition, packaged POL, and bulk POL.

The geographic locations of supply nodes may change over time during the model run. Special classes of materiel may be defined to represent movement over the transportation network of unit equipment and personnel.

3.2 Transportation Network

The transportation function in LOGATAK is simulated by following the movement of discrete shipments over time on a terminal-link network. Up to six modes of travel can be included in a network including air, sea, rail, road, pipeline, and transshipment between modes. Shipments are routed through the network from source to user terminals based on the current status of the network, the priority and the size of the shipment. The loading on the terminals and links is measured and delays associated with travel time, terminal operations, and queueing are used to determine delivery time.

The terminals and links of the transportation network are assigned vulnerability factors and rebuild times. Any element of the network may be attacked at any time during the model run. The model calculates the reduction in capacity and the time it will take to rebuild the element. Shipments are rerouted, utilizing the remaining capacity in a network after an attack.

4. COMPUTER SYSTEM REQUIREMENTS

The LOGATAK model program is written in the FORTRAN language and is currently operating on a Control Data Corporation 6000 series computer. The program is designed on the modular principle and contains over 350 subprograms. The current configuration of the model requires 92,600 words of core storage to execute. This configuration can handle up to 20 demand generators, 5 intermediate stockage points, 5 supply sources, 300 terminals, and 600 links. It also includes the program TARGAA in the same core overlay with the model.

The running time for the model varies depending on the scenario, the transportation network, and the activity being represented. An estimated range for a large application is 10 to 20 minutes of central processor time for a CDC CYBER 73.

CHAPTER II

SCENARIO DESIGN

1. INTRODUCTION AND PURPOSE

This chapter describes a number of factors which must be considered in the design of a scenario for use in the LOGATAK model. This scenario must serve a number of different purposes: it must describe the general operating plan of the military units and their supporting logistics system which is to be subjected to interdiction; it must convert that operational plan into the specific detailed movements of the military units; it must identify and describe the classes of supplies which flow through the logistics system; and, it must describe the supply bases which process these supplies. In considering all of these factors in detail, it must be remembered that computer core is limited, and only data which is of significance to the results of the model exercise should be contained in the scenario. The scenario design must seek a middle ground between two extremes. On the one hand, it cannot be so detailed that the computer bogs down with superfluous information and cannot complete the desired model run, while on the other hand, the scenario must not be so aggregated that factors important to the answer are omitted and the final results thereby preordained. A more detailed discussion of the trade-offs involved in making this balance is contained in Chapter VI, Operating Strategy. Another important point which should be kept in mind during the scenario design is the necessity of using data formats that are compatible with the LOGATAK program. These formats are described in detail in Chapter III, DAMSEL (Data Management and Selection System), and Chapter IV, LOGATAK Inputs.

2. OPERATIONAL PLAN

2.1 Objectives of the Force Subjected to Interdictive Attack

The first step in preparing an operational plan is to clearly define and outline the objectives desired by the side subjected to interdictive attack. These objectives include whether the operation is offensive, defensive, or a combination, the tactics (in general terms) used to achieve these objectives, the desired rate of movement of the forward edge of the battle area (FEBA), and the geographic objectives of the operation.

2.2 Detailed Operational Plan

The overall objectives of the force subjected to interdiction must be expanded into a detailed operational plan which describes the units contained within this force, and the operations which these units conduct against their enemy, as a function of time during the scenario. For example, which of the units are to be in the front line and which in reserve, what types of tactics will the units use, and at what times will special reserves be employed? Since different military forces generally have different doctrines with respect to these matters, it is important to research the operational doctrines of the military force being described, in order to maintain a desirable degree of realism.

2.3 Geographic Locale of Operation

In describing the overall operational plan, the locality in which the operation is to take place must be defined, and the geographic details of this location must be examined in the context of the tactical operations. The presence of geographical features such as rivers, mountain ranges, etc. are significant not only to the operation of the logistics system to be interdicted, but also to the tactical movements of the military units being supported by that logistics system. The detailed operational plan must reflect the presence of geographical features by taking advantage of these features in both attack and defense, as a field commander would do.

3. MILITARY UNITS

3.1 Designations

The military unit organization of the force to be interdicted must be defined in order to generate the desired set of logistic demand generators. It may be necessary, if computer facilities are not secure, to develop a set of coded designations of the units involved to maintain security. By either actual or coded designation, however, every demand generator involved in the scenario must be individually identified by a designation compatible with the LOGATAK model input format.

3.2 Initial Stockage

The initial stockage of each designated demand generator and supply base, in each type of supply to be used in the model, must be defined. The initial stockage is the level of supply available at the beginning of the scenario run, and reflects the "cushion" available to the unit or base against running out of supplies before the logistics system can replace consumption.

3.3. Types of Activity

For every unit of time in the scenario, e.g., day, the type of activity of each demand generator must be defined. Most major countries have published reports which define the consumption rates of various classes of supplies for various types of activity, such as attack against defended positions, meeting engagements, hasty defense, etc. The types of activity defined for each demand generator should correspond as much as possible with the doctrine definitions of activity in order to facilitate the determination of consumption rates. The types of activity for each demand generator can generally be selected from a review of the detailed operational plan. In the interest of reality, if an unusual type of activity is contemplated which does not correspond to any predefined doctrine, a new designation of activity should be adopted.

3.4 Supply Consumption Rates

The consumption rates for each class of supplies and the frequency of orders of these supplies must be defined for each demand generator in the scenario. As previously indicated, standard military logistic doctrine texts are very helpful in determining consumption rates for typical units engaged in standard types of activity. If the analyst believes that the scenario under consideration does not correspond to a standard classification, however, he should use consumption rates and frequency of orders which he feels are realistic in the particular case. The consumption rates and frequency of orders must be defined in a format compatible with the LOGATAK model input requirements.

3.5 Unit Locations

The location of each military unit (demand generator) must be identified each time that the unit moves, and the length of time at each location must be defined. A location of a military unit is generally out in the field, not coincident with any fixed node in the transportation network of the area. The fixed node through which supplies will be sent to the unit field location must be identified, and the temporary transportation link between the military unit location and the fixed node must be described. This description should include length, capacity, and rate of travel. It is necessary to define all successive locations of a given unit for the duration of the scenario so the simulation model can forward supplies to the new unit location if the unit moves while its supplies are in transit in the logistics system. Figure II-1 shows a sample network with successive locations for three tank units in the field tied into the existing transportation network.

3.6 Unit Moves

Depending on whether a particular unit is located in the forward battle area or in the rear area of the logistic network, the movement of a unit from one location to another may create a significant additional load upon a logistic network. The movements of military units which compete for use of the available capacity of a transportation link with the movements of supplies must be carefully accounted for, as military unit moves can

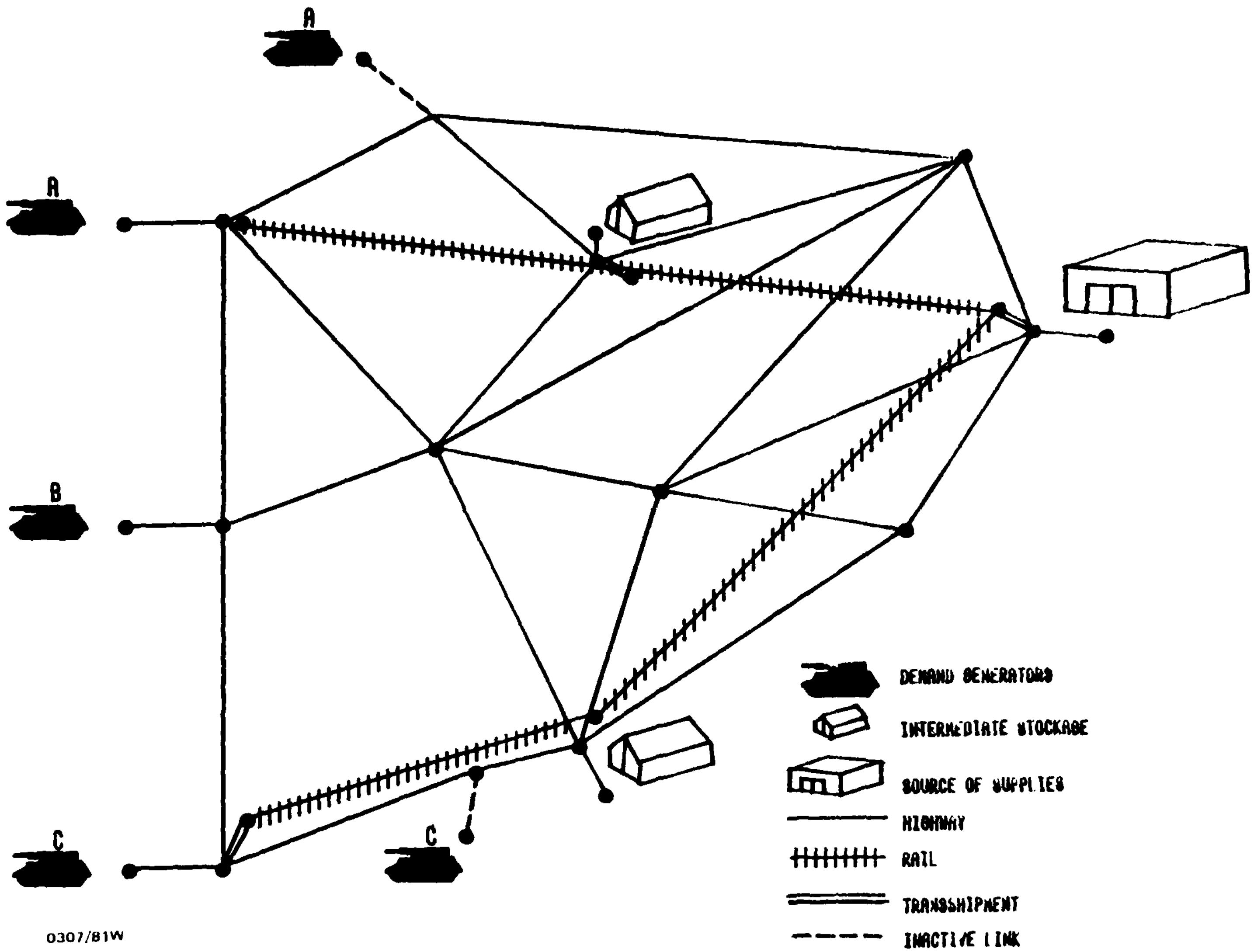

Figure II-1. LOGATAK Network

easily become the most serious load on the logistics net. Such unit moves should receive attention during the scenario design to make sure that reality is preserved and artificial bottlenecks are not created in the system.

4. SUPPLIES

4.1 Classes of Supply

The LOGATAK model will accommodate a large number of classes of supply within the existing model structure. Typical classes of supply are ammunition of various types and POL. Although the capability for handling many types of supplies is present, the analyst should remember that each additional class of supply accounted for in the model consumes an additional amount of computer core capacity and thus reduces the ability to consider other aspects of the problem. The classes of supply used in the model exercise should be restricted to those which have a significant effect on the total load in the logistics system, and classes of supply consisting of only a minor fraction of the total can usually be disregarded without affecting the final answer significantly.

4.2 Priorities

The LOGATAK model will accept the designation of different levels of delivery priority for different classes of supply and of users. The assignment of priority should be made after careful consideration of the operational plan, and the effect on the combat units of a shortage of each class of supply.

4.3 Quantitative Description of Classes of Supply

Each class of supply must be defined according to the weight and cubage associated with a unit amount. For supplies such as ammunition and POL, these numbers may be obtained from standard references.

5. SUPPLY BASES

5.1 Designation of Supply Bases

As in the case of military units, the selection of supply bases must be based on the best available information concerning the types of supplies to be handled and the logistic doctrines of the particular force involved. If computer security is a problem, supply bases may be given coded designations in the same manner as military units.

5.2 Initial Stockages

In the same manner as military units, the initial stockage of each class of supply available at each supply base must be defined. The levels of initial stockage for each level of supply should be consistent with the logistic doctrine with the force involved, as well as the degree of advance preparation assumed before the scenario begins.

5.3 Forwarding of Supply Demand Orders

The LOGATAK model permits the forwarding of supply demand orders from a supply base to another base at a higher echelon, if the first base to receive the order is unable to fill it. Each intermediate supply base in the scenario must be associated with the designation of its next higher echelon supply base, to which the unfilled orders are referred.

5.4 Movements and Locations

In the same manner as military units, the location of each intermediate and source supply base must be identified for each time interval of the scenario. If the supply base moves during the scenario, the time of the move must be identified. Supply bases are usually located closer to the nodes in the fixed transportation network than are military units, but they may still be located a short distance from the nearest transportation terminal node, and the length, capacity and average rate of speed of the connecting link to the terminal node must be specified. Supply bases are frequently tied simultaneously to more than one type of transportation terminal, for example, highway and rail. If a supply base is tied to more than one mode of transportation, the links connecting the supply base to each type of terminal node must be independently specified. Figure II-1 shows supply bases located in a transportation network.

CHAPTER III

DAMSEL: INPUTS AND OUTPUTS

1. INPUTS

1.1 Deck Structure

Inputs to program DAMSEL are concerned with its two basic functions; (1) altering the data base library, and (2) selecting data from the library for analysis. The first function is further divided into two tasks; (1) alterations to link data and (2) alterations to terminal data. These two tasks together with data selection comprise the major blocks of input to program DAMSEL. Any individual input block or combination of blocks may be used for a single DAMSEL run. However input blocks must be in the order shown in Figure III-1 and each block may be used only one per run. If a particular input block is not being utilized it is not included in the input data deck.

1.2 Link Alterations

The first data block to appear, if needed, is link alterations. The formats for these cards are shown in Table III-1. The number of link cards is not constrained, however they must be ordered according to their first terminal number with the smallest number first. Links which are defined by the same first terminal number are grouped together with no further ordering being necessary.

There are three link alterations which can be performed by DAMSEL and are indicated in card column five.

CC5	DAMSEL OPERATION
BLANK	ADD LINK DATA TO LIBRARY
D	DELETE LINK DATA FROM LIBRARY
C	CHANGE ONE OR MORE VARIABLES OF DEFINED LINK IN LIBARY

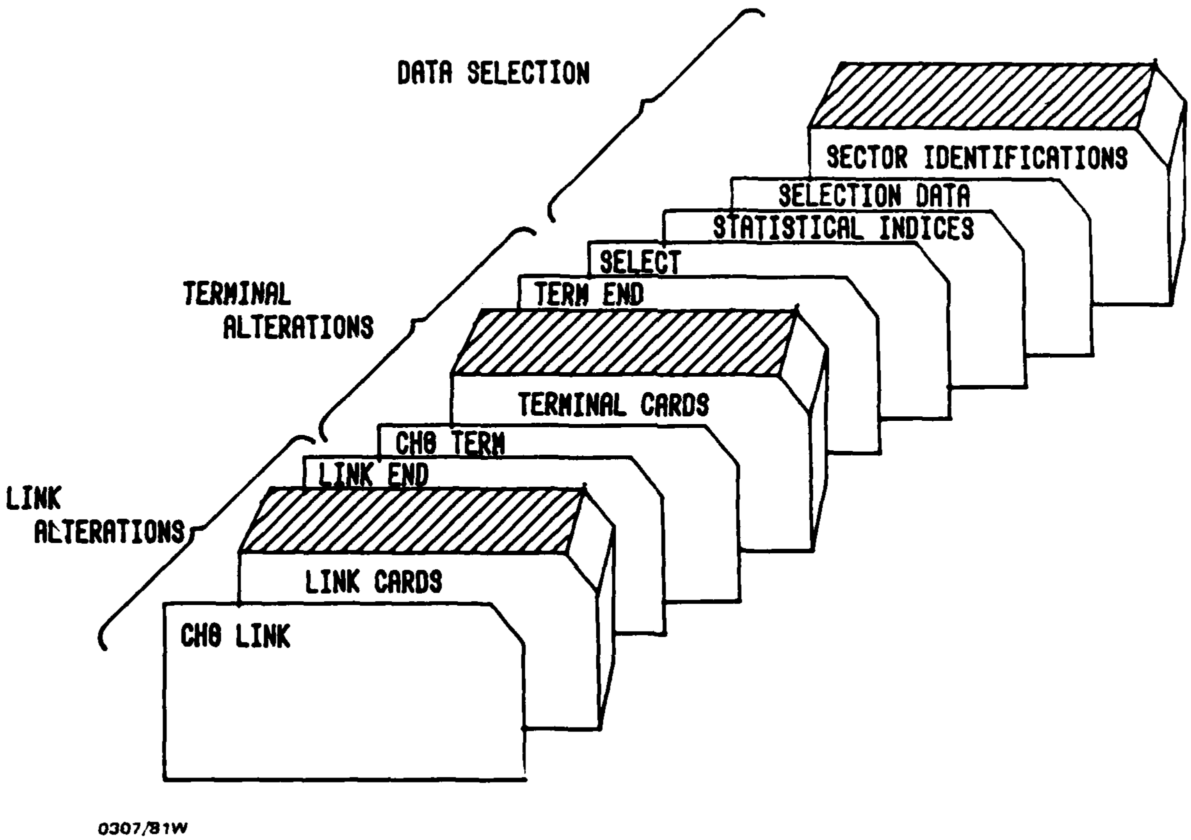

Figure III-1. DAMSEL Input Data Deck

TABLE III-1. LINK DATA CARD FORMATS

<u>FIRST CARD</u>		
CC 1 - CC 5	A5	ENTER CHG (LEFT JUSTIFIED)
CC 6 - CC10	A5	ENTER LINK (LEFT JUSTIFIED)
CC11 - CC80	70X	BLANK
<u>LINK DEFINING CARDS</u>		
CC 1 - CC 4	A4	CARD NAME - LINK
CC 5	A1	PROGRAM INSTRUCTION (C, D, OR BLANK)
CC 6 - CC10	A5	LINK TYPE (RAIL, HWY, TRANS, AIR)
CC11 - CC20	I10	TERMINAL NUMBER
CC21 - CC30	I10	TERMINAL NUMBER
CC31 - CC35	I5	ROUTE NUMBER
CC36 - CC45	F10.3	LINK LENGTH
CC46 - CC55	F10.3	CAPACITY OF LINK
CC56 - CC60	F5.0	VULNERABILITY FACTOR
CC61 - CC65	F5.0	TIME TO REBUILD
CC66 - CC70	F5.0	RATE OF TRAVEL
CC71 - CC77	7X	BLANK
CC78 - CC80	A3	RIVER CODE
<u>LAST CARD</u>		
CC 1 - CC 5	A5	ENTER LINK (LEFT JUSTIFIED)
CC 6 - CC10	A5	ENTER END (LEFT JUSTIFIED)
CC11 - CC80	70X	BLANK

The last operation requires two link cards. The first card must define the link exactly as it appears in the present data base. The following card provides the new values for the variables to be changed. Only the variables in CC21-CC80 may be changed. A value of -1, -1., or blank as appropriate for integer, real, or alpha format can be used to indicate no change of this variable.

1.3 Terminal Alterations

This is the second block of input data unless there are no link alterations being made in which case this block is first. The formats for this block are presented in Table III-2. Here also the number of terminal cards is unconstrained. The terminal cards must be ordered by terminal number beginning with the smallest number.

Similarly to the link data, card column five indicates the operation to be performed.

CC5	DAMSEL OPERATION
BLANK	ADD TERMINAL DATA TO LIBRARY
D	DELETE TERMINAL DATA FROM LIBRARY
C	CHANGE ONE OR MORE VARIABLES OF DEFINED TERMINAL IN LIBARY

Unlike link data only one card is needed to change the variables for a terminal. In addition all variables must be specified including those that are not changed.

1.4 Data Selection

The data selection block of input is last allowing the data library to be altered before data is selected. The formats for these data cards are given in Table III-3. The sector data cards identify the sets of data to be selected from the data library. Each data set is defined by a five digit number. The first four digits uniquely define a sector and the units digit defines the mode of operation of data desired. All modes for a

TABLE III-2. TERMINAL DATA CARD FORMATS

FIRST CARD		
CC 1 - CC 5	A5	ENTER CHG (LEFT JUSTIFIED)
CC 6 - CC10	A5	ENTER TERM (LEFT JUSTIFIED)
CC11 - CC80	70X	BLANK
TERMINAL DEFINING CARDS		
CC 1 - CC 4	A4	CARD NAME - TERM
CC 5	A1	PROGRAM INSTRUCTION (C, D, OR BLANK)
CC 6 - CC10	A5	TYPE OF TERMINAL (RAIL, HWY, AIR)
CC11 - CC30	A20	TERMINAL NUMBER
CC31 - CC40	I10	CODED TERMINAL NUMBER
CC41 - CC50	F10.3	TERMINAL CAPACITY
CC51 - CC55	F5.0	VULNERABILITY FACTOR
CC56 - CC60	F5.0	TIME TO REBUILD
CC61 - CC63	I3	INDEX OF CONSOLIDATION DELAY
CC64 - CC66	I3	INDEX OF LOADING DELAY
CC67 - CC69	I3	INDEX OF THROUGHPUT DELAY
CC70 - CC72	I3	INDEX OF UNLOADING DELAY
CC73 - CC80	8X	BLANK
LAST CARD		
CC 1 - CC 5	A5	ENTER TERM (LEFT JUSTIFIED)
CC 6 - CC10	A5	ENTER END (LEFT JUSTIFIED)
CC11 - CC80	70X	BLANK

TABLE III-3. SELECTION DATA CARD FORMATS

FIRST CARD		
CC 1 - CC 6	A6	ENTER SELECT
CC 7 - CC80	74X	BLANK
STATISTICAL INDICES CARD		
CC 1 - CC 2	I2	AVERAGE WEIGHT OF SHIPMENTS ON LINK (3)
CC 3 - CC 4	I2	TOTAL WEIGHT OF SHIPMENTS OVER LINK (1)
CC 5 - CC 6	I2	AVERAGE CAPACITY OF LINK (3)
CC 7 - CC 8	I2	AVERAGE WEIGHT OF SHIPMENTS IN TERMINAL (3)
CC 9 - CC10	I2	TOTAL WEIGHT OF SHIPMENTS PASSING THROUGH TERMINAL (1)
CC11 - CC12	I2	TOTAL WEIGHT OF SHIPMENTS DELIVERED FROM TERMINALS (1)
CC13 - CC14	I2	AVERAGE CAPACITY OF TERMINAL (3)
CC15 - CC16	I2	AVERAGE NUMBER OF SHIPMENTS IN ARRIVAL QUEUE (3)
CC17 - CC18	I2	AVERAGE NUMBER OF SHIPMENTS IN DEPARTURE QUEUE (3)
CC19 - CC80	62X	BLANK
THIRD CARD		
CC 1 - CC 5	I5	NUMBER OF SECTORS (DATA SETS) TO BE SELECTED
CC 6 - CC10	F5.1	NUMBER OF HOURS OF TRAVEL PER SIMULATION TIME PERIOD
CC11 - CC15	I5	NUMBER OF TERMINALS RESERVED FOR SCENARIO DEFINITION IN LOGATAK
CC16 - CC20	F5.1	NUMBER OF SIMULATION TIME PERIODS PER DAY
CC21 - CC80	60X	BLANK
SECTOR (DATA SET) CARDS		
CC 1 - CC10	I10	SECTOR (DATA SET) IDENTIFICATION NUMBERS IN INCREASING ORDER
CC11 - CC80	I10	
. .		
. .		
CC71 - CC80		

sector can be specified by a zero in the units digit. All data set identifier numbers must be ordered beginning with the smallest number. A negative identifier number causes all associated link data to have a negative capacity indicating the link is inactive. In addition information on the inactive links is stored on a separate file to be punched. These resulting punched cards can be utilized by the LOGATAK user to "turn on" the inactive links.

1.5 Job Control

Eight files are accessed by DAMSEL as indicated on the program card. Utilization of the files is shown in Table III-4.

The DAMSEL program is currently operating on a Control Data Corporation 6000 series computer. The UPDATE program for maintaining and updating source decks on libraries in compressed symbolic format is utilized in the operation of DAMSEL. Figure III-2 shows the control cards used to place the DAMSEL program on the new program library.

The job control cards necessary for program execution once the program is on the library is shown in Figure III-3. Temporary alterations to the DAMSEL program may be made as needed via the UPDATE procedures.

2. OUTPUT

2.1 General

Program DAMSEL provides direct output in two basic forms; (1) printed, and (2) permanent file. The printed output informs the analyst what operations the program has performed and provides a catalog of the data when selected for analysis. Output which will be used again by DAMSEL or is formatted for use by LOGATAK is stored on permanent files.

2.2 Printed Output

2.2.1 Data Library Alterations

When alterations are made to the data library a printed summary of the alterations is provided. An example of this output is shown in Figure III-4.

TABLE III-4. DAMSEL: FILE UTILIZATION

FILE NO.	UTILIZATION
2	DATA LIBRARY
3	WORKING FILE
4	WORKING FILE
5	CARD INPUT
6	PRINTED OUTPUT
8	TERMINALS & LINKS SELECTED & FORMATTED
9	"TURN ON" FOR INACTIVE LINKS
10	NEW DATA LIBRARY (IF CREATED)

```
            (JOB CARD)
REQUEST,NEWPL,*PF,
UPDATE(P,N,F)
CATALOG(NEWPL,DAMSEL PROGRAM, ID=LGKAV)
FTN(I=COMPILE)
7/8/9 END-OF-RECORD
*DECK DAMSEL
          (DAMSEL PROGRAM INSERTED HERE)
6/7/8/9 END-OF-INFORMATION
```

Figure III-2. DAMSEL Program File Creation Job Control

```
             (JOB CARD)
ATTACH(OLDPL,DAMSEL PROGRAM,ID=LGKAV)
UPDATE(F)
ATTACH(TAPE2,DATA LIBRARY,ID=LGKAV)
REQUEST,TAPE8,*PF.
REQUEST,TAPE10,*PF.
FTN(I=COMPILE)
LGO.
CATALOG(TAPE8,LOGATAK INPUT,ID=LGKAV)
CATALOG(TAPE10,NEW DATA LIBRARY,ID=LGKAV)
REWIND,TAPE8.
COPYSBF(TAPE8,OUTPUT)
REWIND,TAPE9.
COPYBF(TAPE9,PUNCH)
REWIND,TAPE10.
COPYSBF(TAPE10,OUTPUT)
7/8/9 END-OF-RECORD
          (TEMPORARY DAMSEL PROGRAM CHANGES INSERTED HERE)
7/8/9 END-OF-RECORD
          (INPUT DATA)
6/7/8/9 END-OF-INFORMATION
```

Figure III-3. DAMSEL Execution Job Control

```
****************************************** DATA LIBRARY SUMMARY ****************************

      833  ALTERATIONS HAVE BEEN MADE TO THE DATA BASE

  LINK ALTERATIONS INCLUDE<          521 ADDITIONS     0 CHANGES     0 DELETIONS

  TERMINAL ALTERATIONS INCLUDE<          312 ADDITIONS     0 CHANGES     0 DELETIONS
```

Figure III-4. Library Alterations Summary

2.2.2 Data Selection

The first printed output, see Figure III-5, when selecting data is a list of the input used for selection identification. The numbers identify the location and mode of the data to be selected. A minus sign indicates that data selected in this sector shall be initially inactive.

The list of terminals selected are printed as shown in Figure III-6. The first terminal number is used by LOGATAK and is unique only for this selection of data. The second terminal number is from the data base and uniquely represents the associated terminal.

Following the list of terminals is the list of associated links, Figure III-7. The two sets of terminal numbers define the end points of the links and are consistent with the terminal numbers identified above.

Finally, as shown in Figure III-8, is the summary of the data selection operation of program DAMSEL.

2.3 Permanent File Output

2.3.1 Data Library Alterations

Whenever alterations are made to the data library the updated library is output onto a permanent file. The library is maintained in an ordered fashion which simplifies the alteration and selection processes. Samples of the data library are shown in Figure III-9.

2.3.2 Data Selection

Data which is selected for analysis is properly formatted for use by LOGATAK stored on permanent file. This file is utilized to create an UPDATE file of input data for LOGATAK. To this UPDATE file must be added the other LOGATAK inputs described in Chapter IV, and the scenario dependent data outlined in Chapter II. The scenario dependent data describes the locations of the supply points and demand generators. These locations are tied into the geographic network through additional links. Links are defined for all positions of the scenario and are formatted as described in Table IV-3. A sample of this file is shown in Figure III-10.

Some of the data selected is initially inactive (i.e., links have negative capacity). A permanent file is created which contains all information, except time of "turn on", necessary to activate these links in the

SELECT DATA FROM THE 53 SECTORS IDENTIFIED BELOW

39400	39410	39420	39430	39440	39450	39460	39470	39480	39490
40410	40420	40430	40440	40450	40460	40470	40480	40490	41400
41410	41420	41430	41440	41450	41460	41480	42410	42420	42430
42440	42470	43390	43400	43410	43420	43430	43440	43450	43460
43470	44370	44390	44400	44410	44430	45380	45390	45400	46410
47390	47400	48440							

Figure III-5. DAMSEL Data Selection List

TERMINALS

TERMINAL NOS.		MODE	LOCATION	CAPACITY	DOCKS	VUL.	REBUILD	DELAY CODES			
141	4141406	HWY	NATENEBT,USSR	500.0	0	0.00	0.00	49	48	41	47
142	4141407	HWY	MOPA,TUR	500.0	0	0.00	0.00	49	48	41	47
143	4141408	HWY	ABISLUFA,TUR	500.0	0	0.00	0.00	49	48	41	47
144	4141409	HWY	KOBAK,TUR	300.0	0	0.00	0.00	49	48	41	47
145	4141410	HWY	ZEYTINLIK,TUR	300.0	0	0.00	0.00	49	48	41	47
146	4141411	HWY	MAMAPLI,TUR	300.0	0	0.00	0.00	49	48	41	47
147	4141412	HWY	MIKRONKAVAK,TUR	300.0	0	0.00	0.00	49	48	41	47
148	4142301	RAIL	AKHALTSIKE,USSR	1500.0	0	0.00	0.00	39	38	32	37
149	4142302	RAIL	MAKHARADZE,USSR	1500.0	0	0.00	0.00	39	38	32	37
150	4142401	HWY	CAMLICATAK,TUR	750.0	0	0.00	0.00	49	48	41	47
151	4142402	HWY	YUKARIDIMA,TUR	500.0	0	0.00	0.00	49	48	41	47
152	4142403	HWY	AKHALTSIKE,USSR	1000.0	0	0.00	0.00	49	48	42	47
153	4142404	HWY	ARDAHAN,TUR	750.0	0	0.00	0.00	49	48	41	47
154	4142405	HWY	TEPELER,TUR	500.0	0	0.00	0.00	49	48	41	47
155	4142406	HWY	KARAKOY,TUR	300.0	0	0.00	0.00	49	48	41	47
156	4142407	HWY	GECITILI,TUR	500.0	0	0.00	0.00	49	48	41	47
157	4142408	HWY	AKARSU,TUR	500.0	0	0.00	0.00	49	48	41	47
158	4142409	HWY	PEHALLI,TUR	500.0	0	0.00	0.00	49	48	41	47
159	4142410	HWY	KUPLUCE,TUR	500.0	0	0.00	0.00	49	48	41	47
160	4142411	HWY	OBA YAYLASI,TUR	300.0	0	0.00	0.00	49	48	41	47
161	4142412	HWY	DUZENLI YAYLASI,TUR	300.0	0	0.00	0.00	49	48	41	47
162	4142413	HWY	MESKHIKEDI,USSR	300.0	0	0.00	0.00	49	48	41	47
163	4142414	HWY	ZAPLETI,USSR	300.0	0	0.00	0.00	49	48	41	47
164	4142415	HWY	TSABALNA,USSR	300.0	0	0.00	0.00	49	48	41	47
165	4142416	HWY	DAKISPAHAULI,USSR	300.0	0	0.00	0.00	49	48	41	47
166	4142417	HWY	ADIGENI,USSR	400.0	0	0.00	0.00	49	48	41	47
167	4142418	HWY	MAKHARADZE,USSR	1500.0	0	0.00	0.00	49	48	41	47

Figure III-6. DAMSEL: Selected Terminals

						LINKS					
TERMINAL NUMBERS				MODE	RT.	LENGTH	CAPACITY	VOL.	REBUILD	SPEED	RIVER
34	3848301	40	3948301	RAIL	0	105.0	4500.0	0.00	0.00	1152.	
34	3848301	35	3848401	TRANS	0	5.0	1000.0	0.00	0.00	24.	
36	3941401	37	3941402	HWY	0	34.0	3400.0	0.00	0.00	768.	
36	3941401	59	4041401	HWY	0	35.0	1400.0	0.00	0.00	384.	
36	3941401	73	4041418	HWY	0	10.0	1000.0	0.00	0.00	768.	
37	3941402	59	4041401	HWY	0	6.0	240.0	0.00	0.00	384.	
37	3941402	74	4042401	HWY	0	40.0	4000.0	0.00	0.00	768.	
38	3942401	39	3942402	HWY	0	20.0	2000.0	0.00	0.00	768.	
38	3942401	40	3942403	HWY	0	31.0	1240.0	0.00	0.00	384.	
38	3942401	74	4042401	HWY	0	24.0	2400.0	0.00	0.00	768.	
39	3942402	40	3942403	HWY	0	17.0	680.0	0.00	0.00	384.	
39	3942402	41	3943401	HWY	0	45.0	4500.0	0.00	0.00	768.	
40	3942403	41	3943401	HWY	0	41.0	1640.0	0.00	0.00	384.	
40	3942403	77	4042404	HWY	0	14.0	560.0	0.00	0.00	384.	
41	3943401	42	3944401	HWY	0	135.0	6750.0	0.00	0.00	576.	
41	3943401	99	4043401	HWY	0	55.0	2750.0	0.00	0.00	576.	
42	3944401	99	4043401	HWY	0	74.0	3700.0	0.00	0.00	576.	
42	3944401	107	4044401	HWY	0	34.0	1700.0	0.00	0.00	576.	
43	3945401	44	3945401	TRANS	0	5.0	1000.0	0.00	0.00	24.	
43	3945401	48	3947301	RAIL	0	276.0	10500.0	0.00	0.00	1152.	
43	3945401	105	4044302	RAIL	0	141.0	6000.0	0.00	0.00	1152.	
45	3945402	112	4044404	HWY	0	86.0	8600.0	0.00	0.00	768.	
45	3945402	115	4045401	HWY	0	77.0	3850.0	0.00	0.00	576.	
46	3946401	47	3946402	HWY	0	57.0	2850.0	0.00	0.00	576.	
46	3946401	49	3947401	HWY	0	104.0	5200.0	0.00	0.00	576.	
47	3946402	49	3947401	HWY	0	79.0	3950.0	0.00	0.00	576.	

Figure III-7. DAMSEL: Selected Links

*** SUMMARY ***

53 SECTIONS

3848000	3941000	3942000	3943000	3944000	3945000	3946000	3947000	3948000	3949000
4041000	4042000	4043000	4044000	4045000	4046000	4047000	4048000	4049000	4140000
4141000	4142000	4143000	4144000	4145000	4146000	4148000	4241000	4242000	4243000
4244000	4247000	4339000	4340000	4341000	4342000	4343000	4344000	4345000	4346000
4347000	4437000	4439000	4440000	4441000	4443000	4538000	4539000	4540000	4641000
4739000	4740000	4844000							

312 TERMINALS

510 LINKS

0 TANKFARMS

RATES OF TRAVEL BASED ON A 24.0 HOUR DAY

Figure III-8. DAMSEL: Selection Summary

```
LINK RAIL   5422301   5423301          131.    10500.          48.
LINK RAIL   5423301   5425302           85.     7500.          48.
LINK RAIL   5425301   5425302           15.      750.          40.
LINK RAIL   5425301   5426301          112.     9000.          48.
LINK RAIL   5425301   5727301          318.    24000.          56.
LINK RAIL   5426301   5327301           69.     6000.          48.
LINK RAIL   5426301   5427301           94.     3750.          40.
LINK RAIL   5427301   5428302           70.     3000.          40.
LINK RAIL   5427301   5528301          100.     3750.          40.
LINK RAIL   5521301   5521302           90.     3750.          40.
LINK RAIL   5521301   5623301          212.    16500.          56.
LINK RAIL   5528301   5530301           99.     7500.          56.
LINK RAIL   5528301   5930301          545.    42000.          56.
LINK RAIL   5530301   5537301          492.    37500.          56.
LINK RAIL   5623301   5924301          360.    27000.          56.
LINK RAIL   5727301   5728301           94.     3750.          48.
LINK RAIL   5930301   6028301          140.    10500.          56.
LINK RAIL   5930301   6029301          106.     4500.          48.
LINK RAIL   5930301   6033301          237.    18000.          56.
LINK RAIL   5939301   6440301          607.    46500.          56.
LINK RAIL   6033301   6130301          276.    10500.          48.
LINK RAIL   6033301   6134301          159.    12000.          56.
LINK RAIL   6134301   6234301          152.    12000.          56.
LINK RAIL   6234301   6434301          256.    19500.          56.
LINK RAIL   6434301   6633301          187.    15000.          56.
LINK RAIL   6633301   6732301          159.    12000.          56.
LINK RAIL   6732301   6833301          253.    19500.          56.
LINK END
CHG  TERM
TERM HWY  KAMENNY UJEZD CZ          4814409   500.            49 48 41 47
TERM HWY  KAJOV CZ                  4814410   500.            49 48 41 47
TERM HWY  CTYRI.DVORY CZ            4814411   500.            49 48 41 47
TERM RAIL KOKSOV BAKSA              4821301     3000.         39 38 32 37
TERM RAIL MUKACHEVO                 4822301     1500.         39 38 33 37
TERM RAIL IVANO FRANKOVSK           4824301     3000.         39 38 33 37
TERM RAIL CHERNOVTSKY               4825301     2250.         39 38 33 37
TERM RAIL BOR CZ                    4912304    750.           39 38 31 37
TERM RAIL MARIANSKE LAZNE CZ        4912305   1500.           39 38 31 37
TERM HWY  PLANA CZ                  4912406  1500.            49 48 41 47
TERM RAIL BREZNICE CZ               4913305   2250.           39 38 32 37
TERM RAIL HRAZDOVICE CZ             4913306   2250.           39 38 32 37
TERM RAIL HOLYSOV CZ                4913307    750.           39 38 31 37
TERM HWY  LNARE CZ                  4913407  1500.            49 48 41 47
TERM HWY  HLUBYNE BREZNICE CZ       4913408  1500.            49 48 41 47
TERM HWY  NEPOMUK CZ                4913409  1500.            49 48 41 47
TERM HWY  LOSINA CZ                 4913410  1500.            49 48 41 47
TERM HWY  PRESTICE CZ               4913411  1500.            49 48 41 47
TERM HWY  HOLYSOV CZ                4913412  1500.            49 48 41 47
TERM RAIL HRADEJOVICE CZ            4914305   1500.           39 38 31 37
TERM RAIL OLESKO CZ                 4914307   1500.           39 38 31 37
TERM RAIL HORBIS CZ                 4914308    750.           39 38 31 37
TERM RAIL BEROUN CZ                 4914309   3750.           39 38 33 37
TERM RAIL MILEVSKO CZ               4914310    750.           39 38 31 37
TERMHWY                             4914401
TERM HWY  TESNICE CZ                4914401   500.            49 48 41 47
TERMOHWY                            4914408
TERM HWY  CHOTYCANY CZ              4914408                   49 48 41 47
TERM HWY  HRAMIVLE CZ               4914409   500.            49 48 41 47
TERM HWY  VIDNAVY CZ                4914410  1500.            49 48 41 47
TERM HWY  TEMELIN CZ                4914411   500.            49 48 41 47
TERM HWY  TYN NAD VLTAVOU CZ        4914412  1500.            49 48 41 47
TERM HWY  MILEVSKO CZ               4914413  1500.            49 48 41 47
TERM HWY  ZALUZANY CZ               4914414   500.            49 48 41 47
TERM HWY  MIROTICE CZ               4914415   500.            49 48 41 47
TERM HWY  BENESOV CZ                4914416  1500.            49 48 41 47
TERM HWY  KOSOVA HORA CZ            4914417   500.            49 48 41 47
```

Figure III-9. Transportation Network Data Library

GUNETTEAM	296	4	0.0	2000.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	297	4	0.0	760.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	298	4	0.0	1000.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	299	4	0.0	1000.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	300	4	0.0	1500.0	0.00	0.00	49	48	42	47	3	1	1	033
~~GUNETTEAM~~	~~301~~	~~4~~	~~0.0~~	~~1000.0~~	~~0.00~~	~~0.00~~	~~49~~	~~48~~	~~42~~	~~47~~	~~3~~	~~1~~	~~1~~	~~033~~
GUNETTEAM	302	3	0.0	2000.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	303	3	0.0	1500.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	304	3	0.0	1500.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	305	3	0.0	2000.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	306	4	0.0	750.0	0.00	0.00	49	48	42	47	3	1	1	033
~~GUNETTEAM~~	~~307~~	~~4~~	~~0.0~~	~~2000.0~~	~~0.00~~	~~0.00~~	~~49~~	~~48~~	~~42~~	~~47~~	~~3~~	~~1~~	~~1~~	~~033~~
GUNETTEAM	308	4	0.0	1000.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	309	4	0.0	750.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	310	4	0.0	750.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	311	3	0.0	4500.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	312	4	0.0	1500.0	0.00	0.00	49	48	42	47	3	1	1	033
~~GUNETTEAM~~	~~313~~	~~3~~	~~0.0~~	~~4500.0~~	~~0.00~~	~~0.00~~	~~39~~	~~38~~	~~32~~	~~37~~	~~3~~	~~1~~	~~1~~	~~033~~
GUNETTEAM	314	3	0.0	1500.0	0.00	0.00	39	38	31	37	3	1	1	033
GUNETTEAM	315	4	0.0	2500.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	316	3	0.0	1500.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	317	3	0.0	2500.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	318	4	0.0	1500.0	0.00	0.00	49	48	42	47	3	1	1	033
~~GUNETTEAM~~	~~319~~	~~3~~	~~0.0~~	~~1500.0~~	~~0.00~~	~~0.00~~	~~39~~	~~38~~	~~33~~	~~37~~	~~3~~	~~1~~	~~1~~	~~033~~
GUNETTEAM	320	3	0.0	2000.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	321	4	0.0	4000.0	0.00	0.00	49	48	43	47	3	1	1	033
GUNETTEAM	322	4	0.0	2000.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	323	3	0.0	2000.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	324	3	0.0	1500.0	0.00	0.00	39	38	32	37	3	1	1	033
~~GUNETTEAM~~	~~325~~	~~3~~	~~0.0~~	~~1500.0~~	~~0.00~~	~~0.00~~	~~39~~	~~38~~	~~32~~	~~37~~	~~3~~	~~1~~	~~1~~	~~033~~
GUNETTEAM	326	4	0.0	2000.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	327	4	0.0	1500.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	328	3	0.0	2000.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	329	3	0.0	2500.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	330	3	0.0	3500.0	0.00	0.00	39	38	32	37	3	1	1	033
~~GUNETTEAM~~	~~331~~	~~3~~	~~0.0~~	~~2000.0~~	~~0.00~~	~~0.00~~	~~39~~	~~38~~	~~32~~	~~37~~	~~3~~	~~1~~	~~1~~	~~033~~
GUNETTEAM	332	3	0.0	3500.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	333	4	0.0	2000.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	334	4	0.0	1500.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	335	4	0.0	1500.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	336	3	0.0	1500.0	0.00	0.00	39	38	32	37	3	1	1	033
~~GUNETTEAM~~	~~337~~	~~3~~	~~0.0~~	~~4000.0~~	~~0.00~~	~~0.00~~	~~39~~	~~38~~	~~32~~	~~37~~	~~3~~	~~1~~	~~1~~	~~033~~
GUNETTEAM	338	3	0.0	1500.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	339	4	0.0	2500.0	0.00	0.00	49	48	42	47	3	1	1	033
GUNETTEAM	340	3	0.0	3000.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	341	4	0.0	3000.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	342	3	0.0	1500.0	0.00	0.00	39	38	32	37	3	1	1	033
~~GUNETTEAM~~	~~343~~	~~3~~	~~0.0~~	~~4500.0~~	~~0.00~~	~~0.00~~	~~39~~	~~38~~	~~32~~	~~37~~	~~3~~	~~1~~	~~1~~	~~033~~
GUNETTEAM	344	3	0.0	1500.0	0.00	0.00	39	38	32	37	3	1	1	033
GUNETTEAM	345	3	0.0	1500.0	0.00	0.00	39	38	33	37	3	1	1	033
GUNETLINK	34	50	106.0	4500.0	0.00	0.00	1152	3			3	1	0	
GUNETLINK	34	35	5.0	1000.0	0.00	0.00	24	6			3	1	0	
GUNETLINK	36	37	14.0	3400.0	0.00	0.00	768	4			3	1	0	
~~GUNETLINK~~	~~36~~	~~56~~	~~36.0~~	~~1400.0~~	~~0.00~~	~~0.00~~	~~384~~	~~4~~			~~3~~	~~1~~	~~0~~	
GUNETLINK	36	73	16.0	1000.0	0.00	0.00	768	4			3	1	0	
GUNETLINK	37	55	7.0	240.0	0.00	0.00	384	4			3	1	0	
GUNETLINK	37	74	40.0	4000.0	0.00	0.00	768	4			3	1	0	
GUNETLINK	38	39	26.0	2000.0	0.00	0.00	768	4			3	1	0	
GUNETLINK	38	40	31.0	1240.0	0.00	0.00	384	4			3	1	0	
~~GUNETLINK~~	~~38~~	~~4[illegible]~~	~~4[illegible].0~~	~~4400.0~~	~~0.00~~	~~0.00~~	~~768~~	~~4~~			~~3~~	~~1~~	~~0~~	
GUNETLINK	39	40	17.0	680.0	0.00	0.00	384	4			3	1	0	
GUNETLINK	39	41	65.0	4500.0	0.00	0.00	768	4			3	1	0	
GUNETLINK	40	41	41.0	1640.0	0.00	0.00	384	4			3	1	0	
GUNETLINK	40	77	14.0	560.0	0.00	0.00	384	4			3	1	0	
GUNETLINK	41	42	135.0	4750.0	0.00	0.00	576	4			3	1	0	
GUNETLINK	41	55	55.0	2750.0	0.00	0.00	576	4			3	1	0	

Figure III-10. DAMSEL: Data Formatted for LOGATAK

LOGATAK simulation. This permanent file can be converted to punched cards (CHNET cards, see Table IV-11) and utilized as input to LOGATAK. Only the "turn on" time needs to be added in card columns 11-20.

CHAPTER IV
LOGATAK INPUTS

1. GENERAL DESCRIPTION

The user must describe the transportation network, the supply nodes, the classes of supply, and the delay distributions used in the simulation. In addition, changes can be made to most of the parameters during the course of a simulation run and attacks on the transportation network can be made at any time. The input data for the LOGATAK model is read by the modules DATAN, RDNET, INITP, INPAR, and FILE at the beginning of the model run. Data to change the transportation network (CHNET), change distribution parameters (CHPAR), change supply parameters (CHPRM), attack supply inventories (ATSUP), attack the network (ATACK), and jam communications (CCCUB), are read in during the model run in the order and at times prespecified in the DATAN input. Figure IV-1 shows a schematic of the input stream for the LOGATAK model.

This chapter describes the input data and the data formats required in each of the above specified areas. The deck to restart the model from a previously saved position is also described.

2. MODEL PARAMETERS

The first cards in a model run specify general model parameters. Table IV-1 shows the format for the five card types that are read by the module DATAN. They are self-explanatory with the possible exception of the Exogenous Events Cards. These cards are the primary method of scheduling events within the model. (Future events may also be scheduled during the run in the CHNET and ATACK card decks.) The end of simulation event and the warmup event are alternatives to the time specifications on the Control Parameters Card. KTRACE is a trace of logical events in the model and LTRACE is a detailed trace of the internal linkage between modules. Both traces may be turned on or off at any time during the simulation. The save

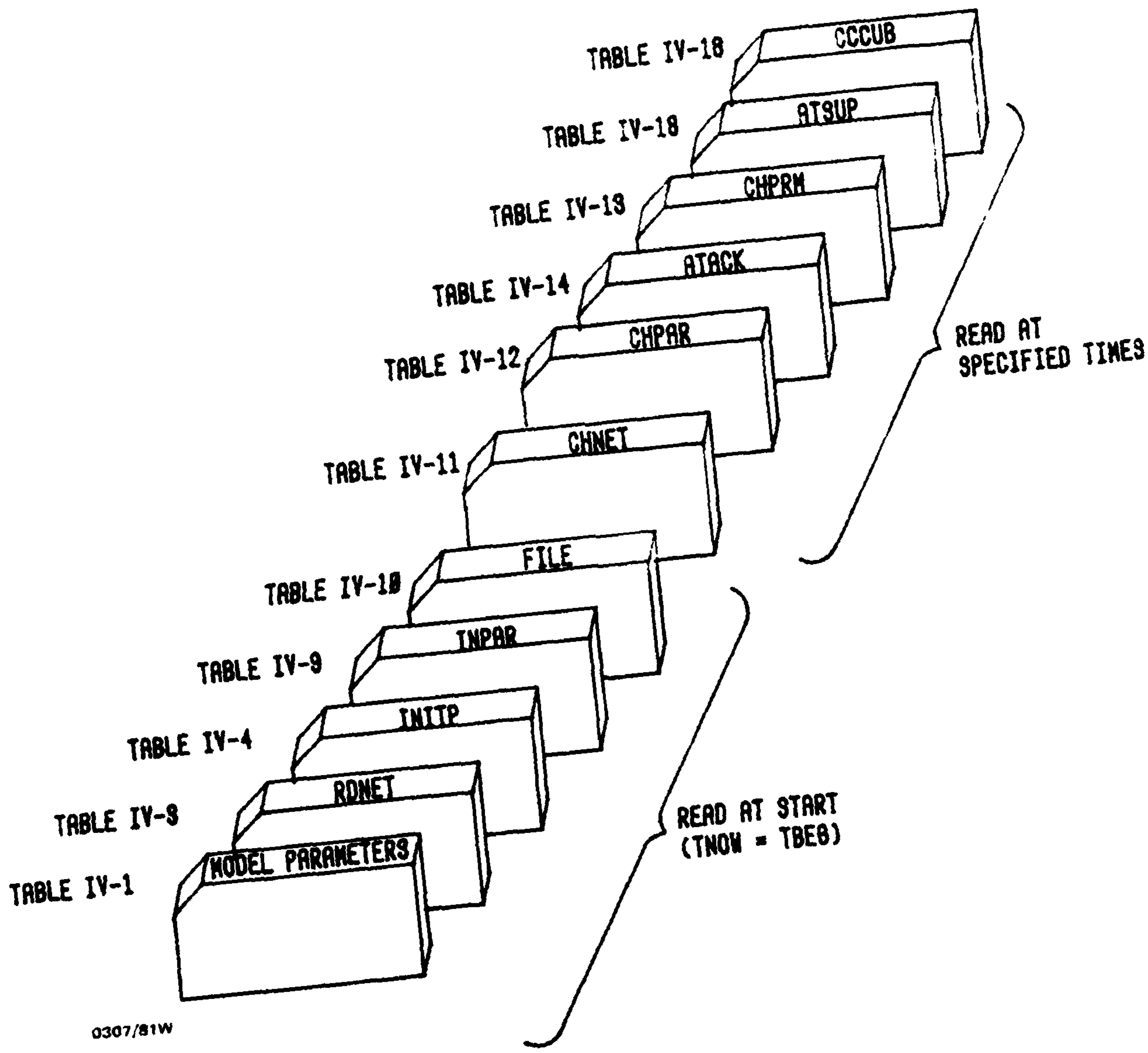

Figure IV-1. Input Setup for LOGATAK Model

TABLE IV-1. MODEL PARAMETER CARD FORMATS

RUN TYPE CARD FORMAT		
COLUMN	FORMAT	DESCRIPTION
1-10	10X	ENTER LOGATAK
11-20	F10.0	CENTRAL PROCESSOR TIME LIMIT MINUS REPORT TIME
21-30	F10.0	RESTART SWITCH .LE. 0 - NORMAL START .GT. 0 - RESTART

MODEL AND RUN IDENTIFIERS CARD FORMAT		
COLUMN	FORMAT	DESCRIPTION
1-12	A12	ANALYST NAME
13-16	I4	PROJECT NUMBER
17-18	I2	MONTH
19-20	I2	DAY OF THE MONTH
21-24	I4	YEAR
25-28	I4	NUMBER OF CYCLES OF THE SIMULATION IN THIS RUN
29-40	A12	MODEL NAME
41-58	A18	RUN NAME
59-80	22X	BLANK

UNIT LABELS CARD FORMAT		
COLUMN	FORMAT	DESCRIPTION
1-6	A6	UNIT OF TIME
7-12	A6	UNIT OF WEIGHT
13-18	A6	UNIT OF CUBE
19-24	A6	UNIT OF DISTANCE
25-80	56X	BLANK

TABLE IV-1. MODEL PARAMETER CARD FORMATS (CONTINUED)

CONTROL PARAMETERS CARD FORMAT

COLUMN	FORMAT	DESCRIPTION
1-5	I5	STOPPING RULE SWITCH (MSTOP) - .EQ. 0 - STOP SIMULATION WHEN EVENT ENDSM (EVENT CODE -1) IS ENCOUNTERED .GT. 0 - STOP SIMULATION WHEN SIMULATED TIME EXCEEDS ENDING TIME TFIN
6-15	10X	BLANK
16-20	I5	VARIABLE NEP, ENTER 1
21-30	F10.3	TBEG, INITIAL VALUE OF SIMULATED TIME
31-40	F10.3	TFIN, LARGEST VALUE OF SIMULATED TIME TO BE REPRESENTED IF MSTOP .GT. 0
41-50	F10.3	TWARM, SIMULATED TIME AT WHICH STATISTICAL ARRAYS ARE TO BE CLEARED
51-54	I4	RANDOM NUMBER SEED
55-80	25X	BLANK

EXOGENOUS EVENTS CARD FORMAT*

COLUMN	FORMAT	DESCRIPTION
1-8	I8	ENTER 1, THE NUMBER OF THE GASP TIME FILE
9-17	F9.3	SIMULATION TIME AT WHICH EVENT SHOULD OCCUR
18-20	3X	BLANK
21-23	I3	EVENT CODE -1 END OF SIMULATION EVENT -2 KTRACE -3 LTRACE -4 WARMUP EVENT -5 SAVE RUN EVENT -6 CORE REPORT -8 EXECUTE A ZINIT SUBNODE -99 EXECUTE TARGAA
24-26	3X	BLANK
27-35	F9.3	ATTRIBUTE 3 OF EVENT. ZINIT SUBNODE NUMBER IF EVENT CODE IS -8. NUMBER OF BOMBS AVAILABLE IF EVENT CODE IS -99.

TABLE IV-1. MODEL PARAMETER CARD FORMATS (CONTINUED)

COLUMN	FORMAT	DESCRIPTION
36-44	F9.3	ATTRIBUTE 4 OF EVENT. SWTICH TO RESCHEDULE TARGAA IF EVENT CODE IS -99. (0-NO, 1-YES)
45-53	F9.3	ATTRIBUTE 5 OF EVENT. TIME DELAY FOR TARGAA RESCHEDULING IF EVENT CODE IS -99.
54-62	F9.3	ATTRIBUTE 6
63-71	F9.3	ATTRIBUTE 7 (ATTRIBUTES 3-8 ARE GENERALLY BLANK)
72-80	F9.3	ATTRIBUTE 8

* THE SUBDECK OF EXOGENOUS EVENTS CARDS MUST BE HEADED BY A CARD CONTAINING -1 IN COLS 7-8 TO CAUSE INITIALIZATION OF ARRAY SETS AND IS ENDED WHEN A CARD WITH 0 IN COL 8 IS ENCOUNTERED.

run event causes all model data values to be placed on FILE3 for use in restarting the model from that point in simulated time. The core report request causes a short report on key array utilization in the model. Each of the above events requires only the time of occurrence and the event code attributes to be specified on the card.

The other two event codes require additional attributes to be specified. The -8 event code causes the ZINIT subnode with the number in attribute 3 to be executed. Table IV-2 lists the available options in LOGATAK. The -99 event code causes the Target Allocation Algorithm (TARGAA) to be executed. A list of preferred targets will be printed out and the number of bombs specified in attribute 3 will be used to schedule attacks. TARGAA can be rescheduled periodically by setting the values in attributes 4 and 5.

3. TRANSPORTATION NETWORK

The links and terminals of a transportation network and all their characteristics are defined in the RDNET input data deck at the beginning of the model run. Table IV-3 shows the formats for the five types of RDNET cards; FILE, LINK, TERM, MODE, and END. Figure IV-2 shows the input card order for the RDNET deck. The FILE card is always read from FILE5, the card reader and all subsequent cards are read from the file specified on the FILE card. This permits a voluminous RDNET deck to be placed on a separate file. For most efficient core utilization, terminals should be numbered consecutively, starting with 33. The first 30 terminals are automatically assigned to the 5 sources of supply, the 5 intermediate supply points, and the 20 demand generators in the model. Terminals 31 and 32 are assigned for use by TARGAA as artificial source and artificial sink terminals.

TERM cards and LINK cards can be intermixed in the deck. The read operation ceases when an END card is encountered. For initial execution of RDNET, the six MODE cards are read. For subsequent executions of RDNET (TNOW.NE.TBEG), the MODE cards are not required. The links in a

TABLE IV-2. ZINIT SUBNODES WHICH CAN BE SCHEDULED EXOGENOUSLY

SUBNODE NUMBER	PURPOSE
2	RDNET - ADDITIONS TO THE TRANSPORTATION NETWORK DURING THE MODEL RUN
3	CHNET - CHANGE THE TRANSPORTATION NETWORK PARAMETERS
4	ATACK - ATTACKS ON THE TRANSPORTATION NETWORK
5	CHPRM - CHANGE THE SUPPLY PARAMETERS
6	CHPAR - CHANGE THE DELAY DISTRIBUTION PARAMETERS (PARAMS)
8	INTERIM SUPPLY REPORT
9	INTERIM TRANSPORTATION REPORT
10	ATSUP - ATTACK SUPPLY
11	CCCUB - COUNTER - C^3
12	SHPMT - EXOGENOUS SHIPMENTS

TABLE IV-3. RDNET DATA CARD FORMATS

SET OF DATA CARDS FOR DESCRIBING LINKS AND TERMINALS IN A TRANSPORTATION NETWORK FOR A MODEL RUN. CONTINUOUS READ UNTIL LAST CARD WITH END CARD TYPE DESIGNATION. SUBSEQUENT CARDS READ FROM FILE SPECIFIED ON FIRST CARD.

FILE DEFINITION CARD - ALL SUBSEQUENT CARD IMAGES ARE READ FROM THE FILE SPECIFIED		
CC1 -CC5	A5	CARD NAME - RDNET
CC6 -CC10	A5	CARD TYPE - FILE
CC11-CC20	I10	FILE NUMBER
CC21-CC80	60X	BLANK
LINK DEFINING CARD -		
CC1 -CC5	A5	CARD NAME - RDNET
CC6 -CC10	A5	CARD TYPE - LINK OR END, LEFT JUSTIFIED
CC11-CC15	I5	TERMINAL NUMBER
CC16-CC20	I5	TERMINAL NUMBER
CC21-CC30	F10.3	LENGTH OF LINK
CC31-CC40	F10.3	CAPACITY OF LINK IN WEIGHT UNITS (NEGATIVE SIGN INDICATES THAT THE LINK IS NOT CURRENTLY ACTIVE)
CC41-CC45	F5.0	VULNERABILITY FACTOR
CC46-CC50	F5.0	TIME TO REBUILD
CC51-CC55	F5.0	RATE OF TRAVEL ON LINK
CC56-CC60	I5	MODE OF LINK
CC61-CC70	10X	NOT USED
CC71-CC72	I2	STATIX - AVG. TONS ON LINK (3)
CC73-CC74	I2	STATIX - TOTAL TONS OVER LINK (1)
CC75-CC76	I2	STATIX - AVG. CAPACITY OF LINK (3)
CC77-CC80	4X	NOT USED
TERMINAL DEFINING CARD -		
CC1 -CC5	A5	CARD NAME - RDNET
CC6 -CC10	A5	CARD TYPE - TERM, LEFT JUSTIFIED
CC11-CC15	I5	TERMINAL NUMBER
CC16-CC20	I5	MODE OF TERMINAL
CC21-CC30	F10.3	NOT USED ON TERM CARD
CC31-CC40	F10.3	CAPACITY OF TERMINAL (NEGATIVE SIGN INDICATES THAT THE TERMINAL IS NOT CURRENTLY ACTIVE)
CC41-CC45	F5.0	VULNERABILITY FACTOR
CC46-CC50	F5.0	TIME TO REBUILD
		INDEX TO PROBABILITY DISTRIBUTIONS FOR DELAY -
CC51-CC55	I5	- SHIPMENT CONSOLIDATION (NEGATIVE VALUE CAUSES CHANGE IN SHIPMENT SIZE)
CC56-CC60	I5	- LOADING

TABLE IV-3. RDNET DATA CARD FORMATS (CONTINUED)

CC61-CC65	I5	- TERMINAL THROUGHPUT (NEGATIVE VALUE FORCES ROUTE RECOMPUTATION)
CC66-CC70	I5	- UNLOADING
CC71-CC72	I2	STATIX - AVG. TONS IN THIS TERMINAL (3)
CC73-CC74	I2	STATIX - TOTAL TONS THROUGH TERMINAL (1)
CC75-CC76	I2	STATIX - TOTAL TONS DELIVERED FROM TERM. (1)
CC77-CC78	I2	STATIX - AVG. CAPACITY OF THIS TERMINAL (3)
CC79	I1	STATIX - AVG. NO. OF SHIPMENTS-ARRIVAL Q (3)
CC80	I1	STATIX - AVG. NO. OF SHIPMENTS-DEPART. Q (3)
MODE DEFINITION CARD - USED ONLY FOR INITIAL RDNET IN MODEL		
CC1 -CC5	A5	CARD NAME - RDNET
CC6 -CC10	A5	CARD TYPE - MODE
CC11-CC15	I5	MODE CODE - ONE CARD FOR EACH MODE TYPE
CC16-CC20	5X	NOT USED
CC21-CC30	F10.3	MAXIMUM NUMBER OF WEIGHT UNITS THAT CAN BE CARRIED IN THIS MODE AT ONE TIME
CC31-CC40	F10.3	MAXIMUM NUMBER OF CUBE UNITS THAT CAN BE CARRIED IN THIS MODE AT ONE TIME
CC41-CC50	F10.3	STATIX - TOTAL UNITS OF WEIGHT TIMES UNITS OF DISTANCE TRANSPORTED IN THIS MODE (1)
CC51-CC80	30X	NOT USED FOR MODES 2 - 6.
FOR MODE 1		
CC51-CC55	I5	LOWEST PRIORITY SHIPMENT THAT CAN TRVL BY AIR
CC56-CC60	I5	UPPER LIMIT ON ARRIVAL QUEUE SIZE
CC61-CC65	I5	UPPER LIMIT ON DEPARTURE QUEUE SIZE
CC66-CC70	I5	STATIX - TOTAL SHIPMENTS SENT ALL MODES (1)
CC71-CC75	I5	STATIX - TOTAL SHIPMENTS LOST ALL MODES (1)
CC76-CC80	I5	STATIX - TOTAL SHIPMENTS DELIVERED ALL MODES (1)

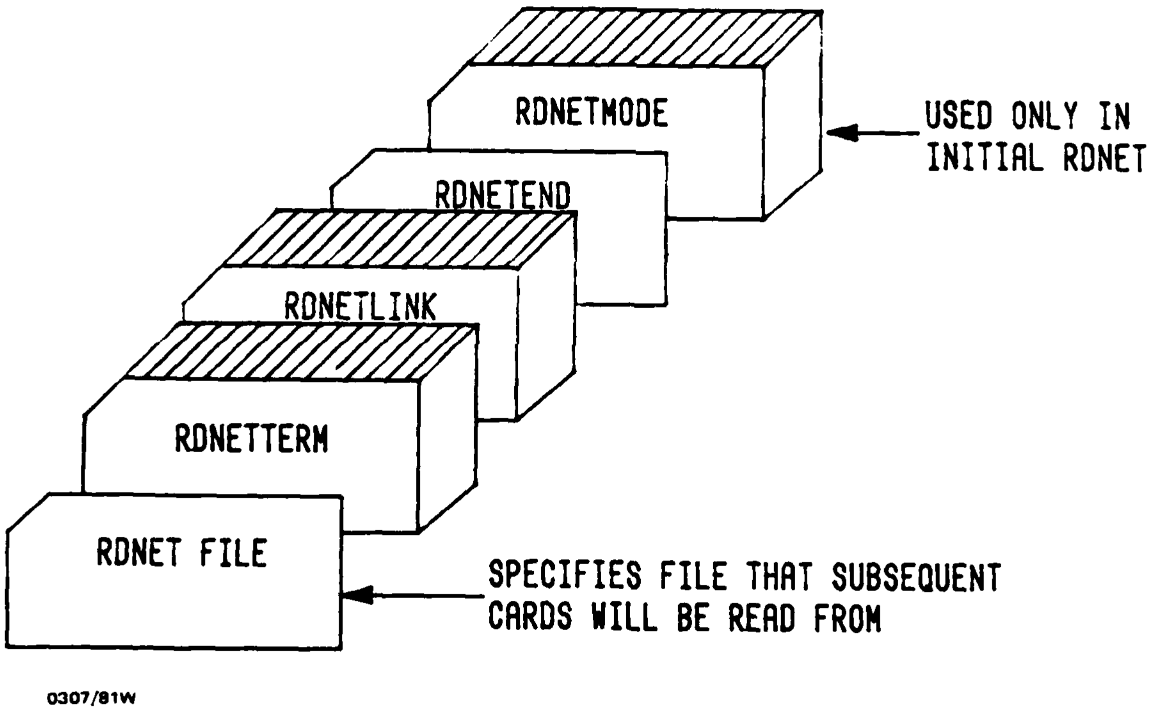

Figure IV-2. Input Setup for RDNET Module transportation network are defined by the terminals at each end. The model orders and numbers the link for ease of access after reading all RDNETLINK cards. RDNET can be used later in a model run to read in additional terminals and/or links. This causes a renumbering of the links and the model prints a table showing the cross reference from the old to the new link numbering.

The first 30 terminals must be linked into the network at the desired terminals to specify the geographic location of the supply nodes. A supply node terminal may be linked in at a number of different points in the network to show different geographic locations over time. In this case, all but one of the links should have a negative capacity, indicating that they are inactive at the current time. They can subsequently be "turned on" in turn with the CHNET capability.

4. SUPPLY PARAMETERS

The characteristics of supply classes and supply nodes are specified on INITP cards. These cards initialize permanent attribute data sets in the model and are quite flexible in format and use. Some portion or all of the supply nodes may be utilized in any given model run. One or more classes of supply can be represented at each supply node by preparing one or more INITP cards of the proper type. In general, there is no fixed limit on the number of classes represented at any node in the model. The supply characteristics of each node in the model are specified by a group of INITP cards. The formats for the three INITP card types are shown in Table IV-4. Card type INITP1 is generally blank in CC7-CC80, but it does offer a method for specifying data for a number of supply classes or resources by grouping them into a resource set. The resource set identification number is then used in INITP2 cards which causes duplication of the data sets for all resources in the set.

4.1 ***ALL Node Data

A supply item common (SICOM) data set must be specified for each item or supply class which is represented in the model run. Each item must

TABLE IV-4. INITP DATA CARD FORMATS

PERMAT INPUT DATA.

CARD TYPE 1 - RESOURCE SET DEFINITION CARD

COLUMN	FORMAT	DESCRIPTION
1 - 6	A6	ENTER INITP1
7 - 14	8X	IGNORED
15 - 20	I6	RESOURCE SET IDENTIFICATION NUMBER
21 - 26	6X	IGNORED
27 - 28	I2	CARD SEQUENCE NUMBER (OPTIONAL)
29	1X	BLANK
30 - 31	I2	NUMBER OF RESOURCE NUMBERS IN THIS SET
32	1X	BLANK
33 - 38	F6.0	FIRST RESOURCE NUMBER
39 - 44	F6.0	SECOND RESOURCE NUMBER
.		
.		
.		
75 - 80	F6.0	EIGHTH RESOURCE NUMBER

ADDITIONAL RESOURCE NUMBERS WILL BE READ FROM SUCCEEDING CARDS UNTIL A DIFFERENT RESOURCE SET NUMBER IS ENCOUNTERED IN CC 15 - 20. THE NUMBER OF RESOURCE NUMBERS IS LIMITED TO 2000 FOR ALL SETS.

TABLE IV-4. INITP DATA CARD FORMATS (CONTINUED)

THE SUBDECK OF ALL TYPE 1 CARDS IS FOLLOWED BY A SERIES OF SUBDECKS (EACH CONTAINING ONE TYPE 2 CARD AND A NUMBER OF TYPE 3 CARDS), ONE FOR EACH NODE THAT REQUIRES PERMAT DATA AND ONE FOR DATA COMMON TO ALL NODES.

CARD TYPE 2 - NODE IDENTIFICATION CARD OR END CARD

COLUMN	FORMAT	DESCRIPTION
1 - 6	A6	ENTER INITP2
7	1X	BLANK
8 - 13	A6	NODE NAME OR ***ALL OR ***END
14 - 80	66X	IGNORED

CARD TYPE 3 - ATTRIBUTE SET VALUES CARD

COLUMN	FORMAT	DESCRIPTION
1 - 6	A6	ENTER INITP3
7	1X	BLANK
8 - 13	A6	RESOURCE FUNCTION
14	1X	BLANK
15 - 20	I6	RESOURCE NUMBER OR RESOURCE SET NUMBER
21	1X	BLANK
22 - 26	A5	FUNCTION TYPE (E.G., SNOD, UNOD, . . .)
27 - 28	I2	CARD SEQUENCE NUMBER (OPTIONAL)
29	IX	BLANK
30 - 31	I2	NUMBER OF ATTRIBUTES IN SET (.LE. 20)
32	1X	BLANK
33 - 38	F6.0	1ST, 9TH, AND 17TH ATTRIBUTE VALUES
39 - 44	F6.0	2ND, 10TH, AND 18TH ATTRIBUTE VALUES
.	.	.
.	.	.
.	.	.
76 - 80	F6.0	8TH AND 16TH ATTRIBUTE VALUES

IF MORE THAN 8 ATTRIBUTE VALUES ARE NEEDED IN A SET THEY ARE LISTED ON ONE OR TWO SUCCEEDING CARDS WITH THE SAME FORMAT AS INDICATED. CC 8-31 MAY BE LEFT BLANK ON THE 2ND AND 3RD CARDS.

be given a unique identification number. Table IV-5 defines the attributes for the SICOM resource function.

4.2 FSB Node Data

The FSB nodes are the top source of supply in the model. Incoming demands are filled in one or more stages to simulate delays encountered. The FSB node can handle the same items or classes of supply as the lower supply echelons do or it can handle "wholesale" classes which are groups of items. These classes are specified in attribute 5 of the SICOM data set. Table IV-6 shows the attributes for the FILTM data set which specify the delays to be imposed for each class and priority pair. Table IV-6 also shows the attributes for the PRI (SNOD) data set which specifies the priority groupings used for the priorities of incoming demands.

4.3 ASB Node Data

The intermediate supply bases require three types of data sets: supply parameters (SUPAR), supply item statistics (SUPIST), and demand statistics (DSTAT). Table IV-7 defines the attributes for each of these data sets. The key information specified for the ASB node is the initial balance on hand or inventory level. The ASB node will handle all items or classes of supply for which there are SUPAR data sets specified.

4.4 DSB Node Data

The DSB nodes are the lowest level supply bases. They generate demands on the supply system and measure the response of the system to those demands. The DSB nodes require three types of data sets: node parameters (NODE), supply item demand generation data at a user node (SIUNOD), and aggregate demand generation data (SAUNOD). Table IV-8 defines the attributes necessary for each of the three data sets. The DSB node will generate demands periodically for as many items or classes of supply as there are SIUNOD data sets. The SAUNOD data set will collect aggregate statistics for all the items at the node. A void SAUNOD card should be included even if there is only one SIUNOD card since a model report is triggered by its presence. The three DSB data set types should be defined for each DSB node which will be active in the model run. The

TABLE IV-5. SICOM ATTRIBUTES

SICOM (ITEM)	-	COMMON SUPPLY ITEM DATA
	-	ONE SET FOR EACH SUPPLY ITEM OR CLASS IN THIS MODEL
	-	USE CARD TYPE INITP3
ATTRIBUTES		
1	-	WEIGHT OF THE ITEM/CLASS UNIT
2	-	CUBE OF THE ITEM/CLASS UNIT
4	-	ITEM TYPE CODE (1 - CONSUMABLE MATERIEL, 2 - UNIT EQUIPMENT AND PERSONNEL)
5	-	SOURCE OF SUPPLY ITEM IDENTIFICATION NUMBER (GENERALLY THE SAME AS SICOM ID NUMBER)
7	-	ITEM SUPPLY PRIORITY

TABLE IV-6. FSB NODE DATA CARD ATTRIBUTES

FILTM (CLASS, PRIORITY) - SUPPLY FILL TIMES - ONE SET FOR EACH ITEM CLASS/PRIORITY COMBINATION DEFINED AT THIS NODE. PRIORITY CLASSES DEFINED IN RESID PRI (SNOD) DEFINED BELOW SHOULD BE USED. - USE CARD TYPE INITP3
ATTRIBUTES 1 - STAT. IND. - NUMBER OF DEMANDS AND QUANTITY DEMANDED (3). 2 - STAT. IND. - NUMBER OF SHIPMENTS AND QUANTITY SHIPPED (3). 3 - STAT. IND. - TIME TO FILL WEIGHTED BY QUANTITY FILLED (3). 4 - PROBABILITY OF A COMPLETE FILL IN ONE STAGE 5 - PROBABILITY OF TWO OR FEWER STAGES 6 - FRACTION FILLED IN STAGE TWO IF ONLY TWO STAGES NEEDED 7 - INDEX TO RANDOM VARIABLE REPRESENTING DELAY TIME TO FILL STAGE TWO WHEN ONLY TWO STAGES NEEDED 8 - PROBABILITY OF THREE OR FEWER STAGES 9 - FRACTION FILLED IN STAGE TWO, IF THREE STAGES NEEDED 10 - FRACTION FILLED IN STAGE THREE, IF THREE STAGES NEEDED 11 - INDEX TO SECOND STAGE DELAY TIME DISTRIBUTION WHEN THREE STAGES NEEDED 12 - INDEX TO THIRD STAGE DELAY TIME DISTRIBUTION WHEN THREE STAGES NEEDED 13 - PROBABILITY OF FOUR OR FEWER STAGES 14, 15, 16 - FRACTIONS FILLED IN SECOND, THIRD, AND FOURTH OF FOUR STAGES 17, 18, 19 - INDEX TO SECOND, THIRD, AND FOURTH STAGE DELAY TIME DISTRIBUTIONS
PRI (SNOD) - SUPPLY PRIORITY CLASSES. - ONE CARD REQUIRED AT THIS NODE, THIS CARD CONTAINS PRIORITY VALUES, SAME AS THE SECOND ARGUMENTS OF RESID FILTM. - USE CARD FORMAT INITP3.
ATTRIBUTES 1 - NUMBER OF PRIORITY CLASSES (I.E., NUMBER OF ENTRIES FOLLOWING). 2 - UPPER LIMIT OF FIRST PRIORITY CLASS 3 - UPPER LIMIT OF SECOND PRIORITY CLASS . . .

TABLE IV-7. ASB NODE DATA CARD ATTRIBUTES

SUPAR (ITEM, SNOD)	- SUPPLY ITEM PARAMETERS - ONE CARD FOR EACH ITEM/CLASS STOCKED AT THIS NODE - USE CARD TYPE INITP3
ATTRIBUTES 1 - SERVICEABLE BALANCE ON HAND	
SUPIST (ITEM, SNOD)	- SUPPLY ITEM STATISTICS - ONE CARD FOR EACH ITEM/CLASS STOCKED AT THIS NODE - USE CARD TYPE INITP3
ATTRIBUTES 1 - STATISTICAL INDEX - SERVICEABLE BALANCE ON HAND (3)	
DSTAT (ITEM, SNOD)	- ITEM DEMAND STATISTICS - ONE CARD FOR EACH ITEM/CLASS STOCKED AT THIS NODE - USE CARD TYPE INITP3
ATTRIBUTES 1 - STATISTICAL INDEX - NUMBER OF DEMANDS RECEIVED AND QUANTITY DEMANDED (3) 2 - STATISTICAL INDEX - NUMBER OF DEMANDS COMPLETELY FILLED WITHOUT DELAY AND QUANTITY FILLED (3) 3 - STATISTICAL INDEX - NUMBER OF DEMANDS PARTIALLY FILLED AND QUANTITY FILLED (3)	

TABLE IV-8. DSB NODE DATA CARD ATTRIBUTES

```
NODE (NODTYP) - NODE PARAMETERS
              - ONE SET FOR EACH NODE TYPE DEFINED AT THIS NODE
              - USE CARD TYPE INITP3

    ATTRIBUTES
         1 - DEMAND GENERATION INTERVAL IN TIME UNITS
         2 - NODE PRIORITY
```

```
SIUNOD (ITEM) - ITEM DEMAND GENERATION DATA
              - ONE SET NEEDED FOR EACH ITEM STOCKED AT THIS NODE
              - USE CARD TYPE INITP3

    ATTRIBUTES
         1 - INDEX OF DISTRIBUTION OF NUMBER OF DEMANDS IN A DEMAND
             GENERATION INTERVAL
         2 - INDEX OF DISTRIBUTION OF QUANTITY PER DEMAND
         6 - STAT. IND. - NUMBER AND QUANTITY OF SUPPLY REQUISITIONS
             SUBMITTED
         7 - STAT. IND. - QUANTITY DUE IN FROM SUPPLY - A TMST STATISTIC
         8 - STAT. IND. - DURATION OF DUE INS FROM SUPPLY
         9 - STAT. IND. - NUMBER AND QUANTITY OF SUPPLY SHIPMENTS RECEIVED
```

```
SAUNOD - AGGREGATE DEMAND GENERATION DATA
       - ONE SET REQUIRED AT THIS NODE
       - USE CARD TYPE INITP3

    ATTRIBUTES
         6 - STAT. IND. - NUMBER AND QUANTITY OF SUPPLY REQUISITIONS
                          SUBMITTED
         7 - STAT. IND. - QUANTITY DUE IN FROM SUPPLY - TMST - TYPE
                          STATISTIC
         8 - STAT. IND. - DURATION OF DUE INS FROM SUPPLY
         9 - STAT. IND. - NUMBER AND QUANTITY OF SUPPLY SHIPMENTS RECEIVED
```

demand frequency and quantity demanded are specified for the node by indirect reference to the distributions in the INPAR data deck. This allows many nodes to use the same distribution if desired.

4.5 INITP Data Deck

Figure IV-3 shows the input deck for the INITP module. Only those supply nodes which are active in the model require data cards in the deck. The subdecks for the nodes and the data set cards within each subdeck may be placed in any order. Figure IV-3 shows one such ordering.

5. DELAY DISTRIBUTIONS

The LOGATAK Model has complete flexibility in specifying stochastic delay distributions in the input data deck. These distributions are read in by the INPAR module. The INPAR card formats are shown in Table IV-9. Note that not only the parameters of the distribution but also the type of distribution may be altered in the input data deck.

6. ACTIVATING DEMAND GENERATION

There are twenty supply demand generator nodes available in the model. Whether and when they are activated is determined by the cards input to the FILE module. There are twenty occurrences of the module FILE in node ZINIT, indexed 1 through 20 to correspond to demand generator nodes DSB01 through DSB20. The format of cards for the FILE module is given in Table IV-10. The minium deck requires 20 FILE cards with indices 1 to 20 in CC6-7 and a zero in CC10. To activate a node, the corresponding FILE card should be preceded by a FILE card with a 1 in CC10 and the time of activation in CC11-20. Demand generation will then continue periodically at the interval specified in the INITP3 NODE card.

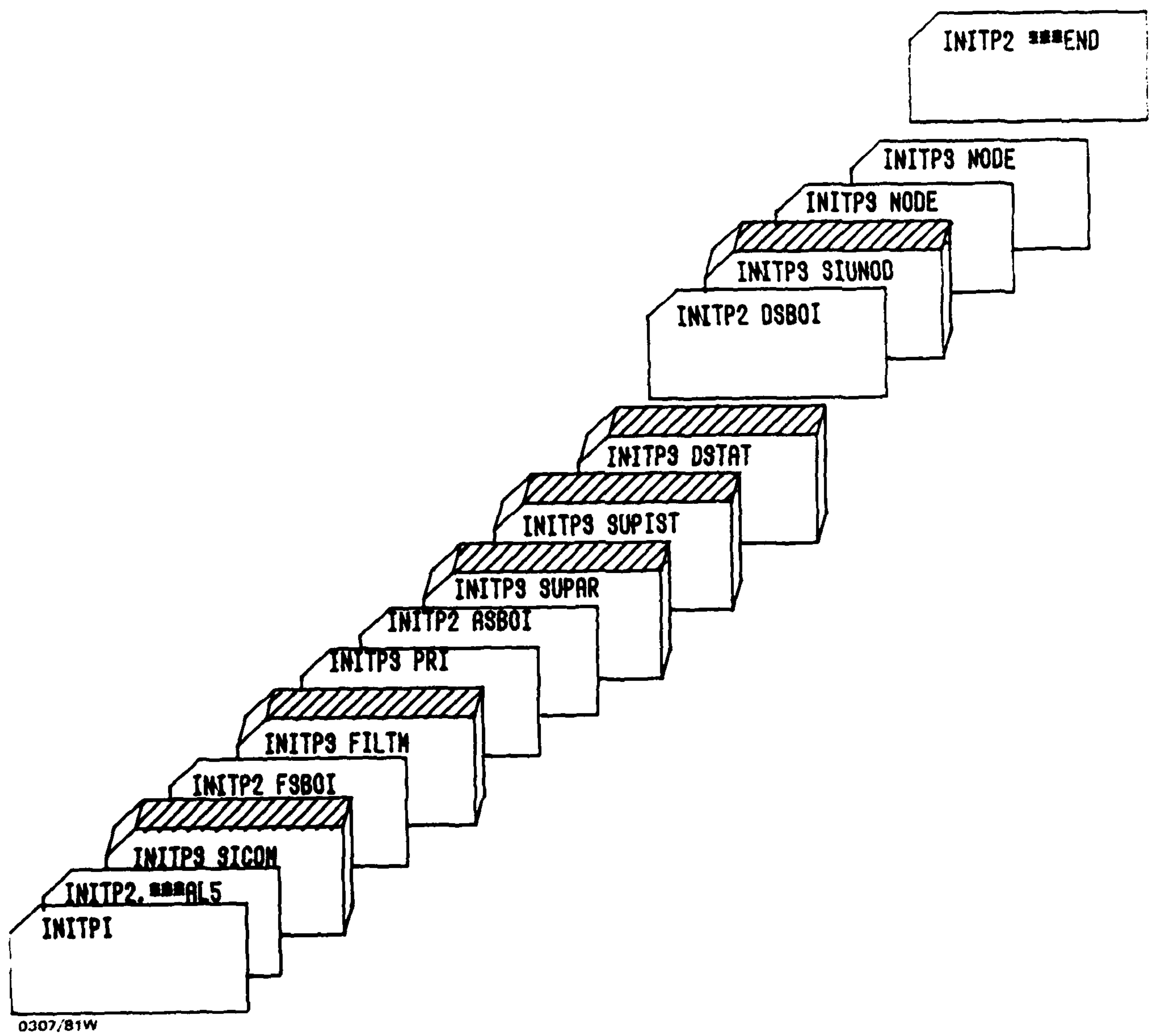

Figure IV-3. Input Setup for INITP Module

TABLE IV-9. INPAR DATA CARD FORMATS

PROBABILITY DISTRIBUTION PARAMETERS

CARD TYPE 1 - NUMBER OF DISTRIBUTIONS - ONE CARD ONLY REQUIRED

COLUMN	FORMAT	DESCRIPTION
1 - 6	A6	ENTER INPAR1
7	1X	BLANK
8 - 12	I5	NUMBER OF PROBABILITY DISTS. IN MODEL
13 - 80	68X	BLANK

CARD TYPE 2 - DISTRIBUTION PARAMETER CARDS - ONE FOR EACH DIST.

COLUMN	FORMAT	DESCRIPTION
1 - 6	A6	ENTER INPAR2
7	1X	BLANK
8 - 12	A5	DISTRIBUTION TYPE *
13	1X	BLANK
14 - 16	I3	DISTRIBUTION INDEX NUMBER **
17	1X	BLANK
18 - 25	F8.0	FIRST PARAMETER
26 - 33	F8.0	SECOND PARAMETER
34 - 41	F8.0	THIRD PARAMETER
42 - 49	F8.0	FOURTH PARAMETER
50 - 80	31X	BLANK

* - SEE FOLLOWING TABLE FOR ALLOWABLE TYPES AND PARAMETERS.
** - THE NUMBER USED IN THE MODEL DESCRIPTION AND/OR INPUT.

TABLE IV-9. INPAR DATA CARD FORMATS (CONTINUED)

RANDOM VARIABLE TYPES AND PARAMETERS

DISTRIBUTION	NAME FOR INPUT	FIRST PARAM.	SECOND PARAM.	THIRD PARAM.	FOURTH PARAM.
NORMAL	NORML	MEAN	MINIMUM	MAXIMUM	STANDARD DEVIATION
LOGNORMAL	LGNOR	MEAN	MINIMUM	MAXIMUM	STD. DEV.
ERLANG	ERLNG	MEAN	MINIMUM	MAXIMUM	ERLANG PARAMETER
POISSON	POSSN	MEAN	MINIMUM	MAXIMUM	BLANK
GEOMETRIC	GEOMT	MEAN	MINIMUM	MAXIMUM	BLANK
CONSTANT	CONST	VALUE	BLANK	BLANK	BLANK
EMPIRICAL DATA **	TABLE	BLANK	NUMBER OF POINTS IN DISTRIBUTION	BLANK	TYPE INDICATOR*
END-OF-DECK	**END				

* - ENTER 0 IF THE DISTRIBUTION IS CONTINUOUS, ENTER 1 IF THE DISTRIBUTION IS DISCRETE.

** - WHEN AN EMPIRICAL DISTRIBUTION IS USED, THE DIST. PARAMETER CARD MUST BE IMMEDIATELY FOLLOWED BY A SERIES OF TYPE 3 CARDS DEFINING THE POINTS IN THE DISTRIBUTION.

TABLE IV-9. INPAR DATA CARD FORMATS (CONTINUED)

CARD TYPE 3 - DISTRIBUTIONS DESCRIBED IN TABULAR FORM

COLUMN	FORMAT	DESCRIPTION
1 - 6	A6	ENTER INPAR3
7 - 8	2X	BLANK
9 - 14	F6.0	MINIMUM VALUE OF DISTRIBUTION
15 - 18	F4.4	PROB. THAT MINIMUM VALUE WILL OCCUR
19 - 24	F6.0	SECOND POINT IN DISTRIBUTION
25 - 28	F4.4	PROBABILITY THAT THE RANDOM VARIABLE WILL NOT EXCEED SECOND VALUE (CUMULATIVE PROB.)
29 - 34	F6.0	THIRD POINT
35 - 38	F4.4	CUMULATIVE PROBABILITY OF THIRD POINT
39 - 44	F6.0	FOURTH POINT
45 - 48	F4.4	CUMULATIVE PROBABILITY OF FOURTH POINT
49 - 54	F6.0	.
55 - 58	F4.4	.
59 - 64	F6.0	.
65 - 68	F4.4	.
69 - 74	F6.0	SEVENTH POINT
75 - 78	F4.4	CUMULATIVE PROBABILITY OF SEVENTH POINT
79 - 80	2X	BLANK

CONTINUATION CARD

1 - 6	A6	ENTER INPAR3
7 - 8	2X	BLANK
9 - 14	F6.0	EIGHTH POINT
15 - 18	F4.4	CUMULATIVE PROBABILITY OF EIGHTH POINT
.	.	.
.	.	.
.	.	.

CONTINUED CODING DISTRIBUTION POINTS, SEVEN TO A CARD, USING AS MANY CARDS AS REQUIRED. THE FIRST POINT IN THE DISTRIBUTION WHICH HAS A CUM. PROB. OF 1.0 IS CONSIDERED AS THE END OF TABLE.

TABLE IV-10. FILE DATA CARD FORMATS

COLUMN	FORMAT	DESCRIPTION
1 - 4	A4	ENTER FILE
5	A1	CARD TYPE, 1 - FIRST CARD, 2 - SECOND CARD
6 - 7	I2	INDEX OF REFERENCE TO FILE, I.E., VAL OF ARGUMENT IFIL
8 - 10	I3	ENTER 1, THE FILE NUMBER FOR THE TIME FILE
11 - 20	F10.0	FIRST ATTRIBUTE-TIME OF OCCURRENCE IF ARGUMENT OF RTURN IS 0, TIME TO WHICH INCREMENT OBTAINED BY RTURN IS TO BE ADDED TO OBTAIN TIME OF OCCURRENCE IF ARGUMENT OF RTURN IS POSITIVE.
21 - 30	F10.0	SECOND ATRIB OR NINTH ATRIB ON CARD 2
31 - 40	F10.0	THIRD ATRIB OR TENTH ATRIB ON CARD 2
41 - 50	F10.0	FOURTH ATRIB OR ELEVENTH ATRIB ON CARD 2
51 - 60	F10.0	FIFTH
61 - 70	F10.0	SIXTH ATRIB
71 - 80	F10.0	SEVENTH ATRIB

THE VERB FILE WILL CONTINUE TO READ EXOGENOUS EVENT CARDS UNTIL IT ENCOUNTERS A CARD WITH FILE 1 IN CC1-5 AND A 0 OR BLANK IN CC8-10. FILE 2 CARDS ARE OPTIONAL. USE ONLY IF NEEDED TO SET NON-ZERO VALUES IN ATRIBS 8, 9, 10, AND 11.

7. CHANGING THE NETWORK

The transportation network characteristics may be changed exogenously at any time during the simulation model run. Any previously defined terminal or link may be activated, deactivated, or have its probability of destruction, capacity, and time to rebuild changed. For links, the rate of travel and length of the link may also be changed. The format of CHNET cards is specified in Table IV-11. A deck of CHNET cards will be read whenever subnode number 3 of node ZINIT is executed by an exogenous event card in the DATAN deck. The actual changes will occur at the time specified on the CHNET card for the particular terminal or link. Changes to links and terminals may be intermixed in the CHNET data deck.

8. CHANGING DISTRIBUTIONS

The probability distributions which control the transportation delays and the demand patterns from the users (e.g., quantity per demand, number of demands) may be changed or be newly defined at any time during a model run. Either the parameter values for the distribution, the type of distribution or both may be changed with the CHPAR module. A deck of CHPAR cards will be read whenever subnode 6 of node ZINIT is executed by an exogenous event card in the DATAN deck. The actual parameter changes will occur at the time the CHPAR cards are read in. The format of CHPAR cards is shown in Table IV-12.

9. CHANGING SUPPLY PARAMETERS

Any value in a supply parameters permanent attribute set that was read in on an INITP card can be changed during the model run utilizing the CHPRM module. This change PERMAT module can also be used to add or delete entire data sets for any of the nodes in the model. This feature can be used, for example, to add a supply class to the inventory for one of the supply bases. The data sets and their attributes are defined in Section D

TABLE IV-11. CHNET DATA CARD FORMATS

CARDS TO CHANGE TRANSPORTATION NETWORK CHARACTERISTICS -

CC1 - CC5	A5	CARD NAME (CHNET)
CC6 - CC7	I2	PRIMARY CARD-ENTER 1
CC8 - CC10	3X	BLANK
CC11 - CC20	F10.0	TIME OF CHANGE
CC21 - CC25	I5	TERMINAL NUMBER OR 0 IF LINK NO. IN CC26-30
CC26 - CC30	I5	TERMINAL NUMBER OR LINK NUMBER FOR LINK CHANGE OR 0 FOR TERMINAL CHANGE
CC31 - CC40	I10	TYPE OF CHANGE REQUESTED - -1 DEACTIVATE LINK/TERMINAL 0 SET CHARACTERISTICS OF LINK/TERMINAL 1 ACTIVATE LINK/TERMINAL 2 REBUILD LINK/TERMINAL
CC41 - CC50	F10.0	NEW RATE OF TRAVEL ON LINK
CC51 - CC60	F10.0	NEW CAPACITY OF LINK/TERMINAL
CC61 - CC70	F10.0	NEW PROBABILITY OF DESTRUCTION
CC71 - CC80	F10.0	NEW TIME TO REBUILD

IF LENGTH OF LINK IS TO BE CHANGED, INCLUDE A SECOND CARD -

CC1 - CC5	A5	CARD NAME (CHNET)
CC6 - CC7	I2	CONTINUATION CARD-ENTER 2
CC8 - CC10	3X	BLANK
CC11 - CC20	F10.0	NEW LENGTH OF LINK

IF RATE, CAPACITY, PROB. DESTRUC., OR TIME TO REBUILD ARE NOT TO BE CHANGED -- ENTER A VALUE OF -1.

END CARD

CC1 - CC5	A5	CARD NAME (CHNET)
CC6 - CC7	I2	ENTER 0
CC11 - CC80	73X	BLANK

TABLE IV-12. CHPAR DATA CARD FORMATS

COLUMN	FORMAT	DESCRIPTION
1 - 6	A6	ENTER CHPAR1
7	1X	BLANK
8 - 25	3A6	NAME OF CHANGE SET (E.G., TIME, PURPOSE, . . .)
26 - 30	I5	NON-FATAL SWITCH (0 - ERRORS ARE FATAL, 1 - ERRORS ARE FLAGGED ONLY)
31 - 80	50X	BLANK

CARD TYPE 2 - DISTRIBUTION PARAMETER CARDS - ONE FOR EACH DIST. TO BE CHANGED

COLUMN	FORMAT	DESCRIPTION
1 - 6	A6	ENTER CHPAR2
7	1X	BLANK
8 - 12	A5	DISTRIBUTION TYPE *
13	1X	BLANK
14 - 16	I3	DISTRIBUTION INDEX NUMBER **
17	1X	BLANK
18 - 25	F8.0	FIRST PARAMETER
26 - 33	F8.0	SECOND PARAMETER
34 - 41	F8.0	THIRD PARAMETER
42 - 49	F8.0	FOURTH PARAMETER
50 - 80	31X	BLANK

* - SEE FOLLOWING TABLE FOR ALLOWABLE TYPES AND PARAMETERS.
** - THE NUMBER USED IN THE MODEL DESCRIPTION AND/OR INPUT.

TABLE IV-12. CHPAR DATA CARD FORMATS (CONTINUED)

RANDOM VARIABLE TYPES AND PARAMETERS

DISTRIBUTION	NAME FOR INPUT	FIRST PARAM.	SECOND PARAM.	THIRD PARAM.	FOURTH PARAM.
NORMAL	NORML	MEAN	MINIMUM	MAXIMUM	STANDARD DEVIATION
LOGNORMAL	LGNOR	MEAN	MINIMUM	MAXIMUM	STD. DEV.
ERLANG	ERLNG	MEAN	MINIMUM	MAXIMUM	ERLANG PARAMETER
POISSON	POSSN	MEAN	MINIMUM	MAXIMUM	BLANK
GEOMETRIC	GEOMT	MEAN	MINIMUM	MAXIMUM	BLANK
CONSTANT	CONST	VALUE	BLANK	BLANK	BLANK
EMPIRICAL DATA **	TABLE	BLANK	NUMBER OF POINTS IN DISTRIBUTION	BLANK	TYPE INDICATOR*
END-OF-DECK	**END				

* - ENTER 0 IF THE DISTRIBUTION IS CONTINUOUS, ENTER 1 IF THE DISTRIBUTION IS DISCRETE.

** - WHEN AN EMPIRICAL DISTRIBUTION IS USED, THE DIST. PARAMETER CARD MUST BE IMMEDIATELY FOLLOWED BY A SERIES OF TYPE 3 CARDS DEFINING THE POINTS IN THE DISTRIBUTION.

TABLE IV-12. CHPAR DATA CARD FORMATS (CONTINUED)

CARD TYPE 3 - DISTRIBUTIONS DESCRIBED IN TABULAR FORM

COLUMN	FORMAT	DESCRIPTION
1 - 6	A6	ENTER CHPAR3
7 - 8	2X	BLANK
9 - 14	F6.0	MINIMUM VALUE OF DISTRIBUTION
15 - 18	F4.4	PROBABILITY THAT MINIMUM VALUE WILL OCCUR
19 - 24	F6.0	SECOND POINT IN DISTRIBUTION
25 - 28	F4.4	PROBABILITY THAT THE RANDOM VARIABLE WILL NOT EXCEED SECOND VALUE (CUMULATIVE PROB.)
29 - 34	F6.0	THIRD POINT
35 - 38	F4.4	CUMULATIVE PROBABILITY OF THIRD POINT
39 - 44	F6.0	FOURTH POINT
45 - 48	F4.4	CUMULATIVE PROBABILITY OF FOURTH POINT
49 - 54	F6.0	.
55 - 58	F4.4	.
59 - 64	F6.0	.
65 - 68	F4.4	.
69 - 74	F6.0	SEVENTH POINT
75 - 78	F4.4	CUMULATIVE PROBABILITY OF SEVENTH POINT
79 - 80	2X	BLANK

CONTINUATION CARD

COLUMN	FORMAT	DESCRIPTION
1 - 6	A6	ENTER CHPAR3
7 - 8	2X	BLANK
9 - 14	F6.0	EIGHTH POINT
15 - 18	F4.4	CUMULATIVE PROBABILITY OF EIGHTH POINT
.	.	.
.	.	.
.	.	.

CONTINUE CODING DISTRIBUTION POINTS, SEVEN TO A CARD, USING AS MANY CARDS AS REQUIRED. THE FIRST POINT IN THE DISTRIBUTION WHICH HAS A CUM. PROB. OF 1.0 IS CONSIDERED AS THE END OF TABLE.

of this chapter. The format of CHPRM cards is shown in Table IV-13. Each CHPRM deck consists of a CHRPM1 card that labels it, followed by a sequence of CHPRM2 cards that specify the data set to be changed by node name and data set name. If more than 4 elements of a data set are to be changed, one or more continuation cards of type CHPRM3 must follow a CHPRM2 card. The last CHPRM2 card in the deck must have ***END in CC7-CC12. The type of change to be performed is specified on each CHPRM2 card with the following codes:

CHGEL - change one element (add the given value to the existing value)
SETEL - set one element (see the value to the given value)
SETSET - set the values of a set of attributes
ADDSET - add the set of attributes to the model
RELSET - release a set of attributes from the model
MLTEL - multiply the value of one element by the given value.

A deck of CHPRM cards will be read whenever subnode 5 of node ZINIT is executed by an exogenous event card in the DATAN deck. The actual changes will occur at that time.

10. SCHEDULING NETWORK ATTACKS

Attacks on links and terminals in the transportation network may be scheduled exogenously at any time. One card is used in the ATACK deck for each sortie or attack on a single transportation element. The card specifies the time of the attack and enables the user to change any of the characteristics of the link or terminal prior to the attack. The model then calculates the effect of the attack, reduces the capacity, and schedules a rebuild event to restore the existing capacity. The format of ATACK cards is specified in Table IV-14. A deck of ATACK cards will be read whenever subnode number 4 of node ZINIT is executed by an exogenous event card in the DATAN deck. Attacks to links and terminals may be intermixed in the ATTACK deck. Links may be identified by their number or by their two end terminals. The former should be used if there is more than one link between the same two terminals to insure that the proper link is attacked.

TABLE IV-13. CHPRM DATA CARD FORMATS

DECK OF CHPRM TO CHANGE PERMAT DATASETS -

CHPRM1 CARD -

CC 1-CC 6	A6	ENTER CHPRM1
CC 7-CC12	A6	OPTIONAL NAME FOR THIS CHANGE SET
CC13-CC14	12	NON-FATAL SWITCH (0-ERRORS ARE FATAL, 1-INPUT ERRORS ARE FLAGGED ONLY)

CHPRM2 CARD -

CC 1-CC 6	A6	ENTER CHPRM2
CC 7-CC12	A6	TYPE OF CHANGE - CHGEL, SETEL, SETSET, ADDSET, RELSET OR MLTEL. (***END FOR LAST CARD)
CC13-CC17	A5	NAME OF NODE DATASET IS ASSOCIATED WITH OR **ALL
CC18-CC23	A6	PERMAT RESOURCE FUNCTION NAME (E.G., SUPAR, SICOM)
CC24-CC33	I10	RESOURCE IDENTIFIER (E.G., ITEM NUMBER)
CC34-CC37	A4	FUNCTION TYPE (E.G., SNOD, SN01, MNOD)
CC38-CC40	I3	ATTRIBUTE NUMBER OF NUMBER OF ATTRIBUTES
CC41-CC50	F10.0	SINGLE VALUE TO BE USED OR FIRST ATTRIBUTE
(FOLLOWING ONLY USED FOR ADDSET AND SETSET)		
CC51-CC60	F10.0	SECOND ATTRIBUTE
CC61-CC70	F10.0	THIRD ATTRIBUTE
CC71-CC80	F10.0	FOURTH ATTRIBUTE

CHPRM3 CARD - ONLY USED FOR ADDSET OR SETSET WITH MORE THAN 4, 11, OR 18 ATTRIBUTES.

CC 1-CC 6	A6	ENTER CHPRM3
CC 7-CC10	4X	NOT USED
CC11-CC20	F10.0	FIFTH, TWELFTH, OR NINETEENTH ATTRIBUTE
CC21-CC30	F10.0	SIXTH, THIRTEENTH, OR TWENTIETH ATTRIBUTE
CC31-CC40	F10.0	SEVENTH OR FOURTEENTH ATTRIBUTE
CC41-CC50	F10.0	EIGHTH OR FIFTEENTH ATTRIBUTE
CC51-CC60	F10.0	NINTH OR SIXTEENTH ATTRIBUTE
CC61-CC70	F10.0	TENTH OR SEVENTEENTH ATTRIBUTE
CC71-CC80	F10.0	ELEVENTH OR EIGHTEENTH ATTRIBUTE

LAST CARD IN DECK IS A CHPRM2 CARD WITH ***END IN CC 7-CC12.
FOR A VACUOUS DECK, THE ***END CARD MAY BE A CHPRM1 CARD.

TABLE IV-14. ATACK DATA CARD FORMATS

CARDS TO ATTACK TRANSPORTATION NETWORK -

CC1	- CC5	A5	CARD NAME (ATACK)
CC6	- CC7	I2	PRIMARY CARD - ENTER 1
CC8	- CC10	3X	BLANK
CC11	- CC20	F10.0	TIME OF ATTACK
CC21	- CC25	I5	TERMINAL NUMBER OR 0 IF LINK NO. IN CC26-30
CC26	- CC30	I5	TERMINAL NUMBER OR LINK NUMBER FOR LINK CHANGE OR 0 FOR TERMINAL CHANGE
CC31	- CC40	I10	TYPE OF CHANGE REQUESTED - 3, ATTACK
CC41	- CC50	F10.0	NEW RATE OF TRAVEL ON LINK
CC51	- CC60	F10.0	NEW CAPACITY OF LINK/TERMINAL
CC61	- CC70	F10.0	NEW PROBABILITY OF DESTRUCTION
CC71	- CC80	F10.0	NEW TIME TO REBUILD

IF LENGTH OF LINK IS TO BE CHANGED, INCLUDE A SECOND CARD -

CC1	- CC5	A5	CARD NAME (ATACK)
CC6	- CC7	I2	CONTINUATION CARD - ENTER 2
CC8	- CC10	3X	BLANK
CC11	- CC20	F10.0	NEW LENGTH OF LINK

END CARD

CC1	- CC5	A5	CARD NAME (ATACK)
CC6	- CC7	I2	ENTER 0
CC8	- CC80	73X	BLANK

IF RATE, CAPACITY, PROB. DESTRUC., OR TIME TO REBUILD ARE NOT TO BE CHANGED -- ENTER A VALUE OF -1. THE OLD VALUE FOR PROBABILITY OF DESTRUCTION WILL BE USED FOR THIS ATTACK. OTHER NEW VALUES (RATE, CAPACITY, . . .) WILL BE USED AS THE VALUE THAT THE LINK/TERM IS RESULT TO.

11. SCHEDULING SUPPLY POINT ATTACKS

Attacks on intermediate stockage points may be scheduled exogenously at any time. One card is used in an ATSUP deck for each attack on a supply point. All classes of material or specific classes may be destroyed as specified on the ATSUP card. The card specifies the time of the attack and the probability of destruction. The model then calculates the effect of the attack, reduces the balance on hand, and orders the materiel destroyed to replenish the inventory levels. The format of ATSUP cards is specified in Table IV-15. A deck of ATSUP cards will be read whenever subnode number 10 of node ZINIT is executed by an exogenous event card in the DATAN deck. Supply points are identified on the ATSUP cards by their node number in the LOGATAK model description. These numbers are shown in Table IV-15.

12. SCHEDULING COMMUNICATIONS JAMMING

Jamming of information about the condition of the transportation network may be scheduled exogenously at any time. One card is used in a CCCUB deck to initiate jamming of information for a link in the network. Jamming may be scheduled by the model to stop after a given period of time or it may be turned off exogenously by another CCCUB card. Information about the link capacity and the traffic on the link is denies to the transportation routing logic while the communications jammed. The format of CCCUB cards is shown in Table IV-16. A deck of CCCUB cards will be read whenever subnode number 12 of node ZINIT executed by an exogenous event card in the DATAN deck. Links are identified by two end terminal numbers or the link number on the CCCUB card.

13. RESTART INPUT DECK

The major input to a restart run is a Restart File containing the status of the model saved at some point during an earlier run. The model

TABLE IV-15. ATSUP DATA CARD FORMATS

CARDS TO ATTACK SUPPLY INVENTORIES -

CC1	- CC5	A5	CARD NAME (ATSUP)
CC6	- CC7	I2	PRIMARY CARD - ENTER 1
CC8	- CC10	3X	BLANK
CC11	- CC20	F10.0	TIME OF ATTACK
CC21	- CC30	F10.0	NUMBER OF NODE ATTACKED*
CC31	- CC40	F10.0	NUMBER OF PARAMETER SLOT OF ATSUP TO SCHEDULE REPLENISHMENT**
CC41	- CC50	F10.0	PROBABILITY OF DESTRUCTION-OR- NEGATIVE
CC51	- CC60	F10.0	SUPPLY ITEM/CLASS NUMBER-OR-ZERO FOR ALL ITEMS/CLASSES
CC61	- CC80	20X	BLANK

END CARD

CC1	- CC5	A5	CARD NAME (ATSUP)
CC6	- CC7	I2	END CARD - ENTER 0
CC8	- CC80	73X	BLANK

*	ASB01 - 6	**	ASB01 - 1
	ASB02 - 7		ASB02 - 2
	ASB03 - 8		ASB03 - 3
	ASB04 - 9		ASB04 - 4
	ASB05 - 10		ASB05 - 5

TABLE IV-16. CCCUB DATA CARD FORMATS

CARDS TO JAM COMMUNICATIONS FROM A LINK -

CC1 - CC5	A5	CARD NAME (CCCUB)
CC6 - CC7	I2	PRIMARY CARD - ENTER 1
CC8 - CC10	3X	BLANK
CC11 - CC20	F10.0	TIME OF CHANGE IN COUNTER C-CUBE ACTIVITY
CC21 - CC25	I5	TERMINAL NUMBER OR 0 IF LINK NO. IN CC26-30
CC26 - CC30	I5	TERMINAL NUMBER OR LINK NUMBER IF 0 IN CC21-CC25
CC31 - CC40	I10	KEY TO EVENT TYPE (0 - BEGIN A JAM 1 - END A JAM)
CC41 - CC50	F10.0	PROBABILITY OF A SUCCESSFUL JAM (.6=60) PERCENT CHANCE OF A JAM)
CC51 - CC60	F10.0	LENGTH OF JAM (.GE.0 - TIME VALUE, .LT.0 - NEGATIVE INDEX TO PARAM DISTRIBUTION)
CC61 - CC80	20X	BLANK

END CARD

CC1 - CC5	A5	CARD NAME (CCCUB)
CC6 - CC7	I2	END CARD - ENTER 0
CC8 - CC80	73X	BLANK

can be restarted at that point in simulation time and continued for an arbitrary period of time. In addition to the Restart File, the model requires a minimum of four input cards. Additional cards to schedule exogenous events after the restart time may be included optionally. The user is remined that all events in the time file on the Restart File are waiting to occur and should not be reentered in card form. Figure IV-4 shows the card deck setup for a restart run. The format for the LOGATAK card is shown in Table IV-17. The format for the Restart File Identification card is shown in Table IV-18. The restart run can proceed only if the identifiers on this card match those read from the header record of the Restart File. For reference, when a Restart File is initially created, a notice is written which includes the format and content of the restart file identification card which will match the header record on the file. The third card contains the amount of additional time to be simulated and the warmup interval. This card is described in Table IV-19. The fourth and last card of the minimum restart data deck is a card with a zero in column 8 representing the end of the exogenous events subdeck.

If exogenous events are to be read from cards by a restart run, they are included between the third and fourth cards in the four-card deck just outlined. Their format is that given in Table IV-1. Note that regardless of whether exogenous events are included, the initial card of this subdeck as described in Table IV-1 is not desirable in a restart run since its purpose - to trigger initialization of the event filing array - is antithetical to the purpose of a restart run, namely to start with the files of the model at more realistic states than the empty one used when starting from cards.

Figure IV-4 also shows optional subdecks of change cards which may be read by the model in the order and at the times specified by exogenous event cards or existing events in the time file. These decks have been previously described in this chapter.

TABLE IV-17. LOGATAK CARD FORMAT FOR RESTART

COLUMN	FORTRAN FORMAT	DESCRIPTION
1-10	10X	ENTER "LOGATAK" IN COLS 1-6
11-20	F10.0	CENTRAL PROCESSOR TIME LIMIT IN SECONDS - CONTROL IS GIVEN TO THE END-OF-RUN REPORTING AND EXIT SEQUENCE IF THE ELAPSED CENTRAL PROCESSOR TIME SINCE THE RESTART RUN BEGAN EXCEEDS THIS LIMIT
21-30	F10.0	RESTART SWITCH, SET TO 1.

TABLE IV-18. RESTART FILE IDENTIFICATION CARD FORMAT

COLUMN	FORTRAN FORMAT	DESCRIPTION
1-6	A6	"RESTART," CARD IDENTIFIER
7-8	2X	IGNORED
9-20	2A6	MODEL NAME
21-22	2X	IGNORED
23-40	3A6	RUN NAME
41-42	2X	IGNORED
43-44	I2	MONTH
45-46	I2	DAY
47-50	I4	YEAR
51	1X	IGNORED
52-61	F10.3	SIMULATON TIME AT WHICH RESTART FILE WAS WRITTEN
62	1X	IGNORED
63-66	I4	PROJECT NUMBER
67-68	2X	IGNORED
69-80	2A6	ANALYST'S NAME

TABLE IV-19. RESTART CONTROL PARAMETERS CARD FORMAT (REGASP)

COLUMN	FORTRAN FORMAT	DESCRIPTION
1-6	A6	"REGASP," CARD IDENTIFIER
7-10	4X	IGNORED
11-20	F10.3	AMOUNT OF TIME TO BE SIMULATED
21-30	F10.3	WARMUP INTERVAL AFTER WHICH STATISTICS ARRAYS ARE CLEARED a/
31-40	F10.3	RANDOM NUMBER SEED; IF ZERO, THAT SPECIFIED IN THE SAVRUN FILE IS USED
41-80	40X	IGNORED

a. IF THE WARMUP INTERVAL PLUS THE TNOW AT WHICH RESTART OCCURS IS LESS THAN TBEG OF THE ORIGINAL RUN, I.E., IF (WARMUP INTERVAL) < - (TNOW AT RESTART), NO WARMUP EVENT OCCURS.

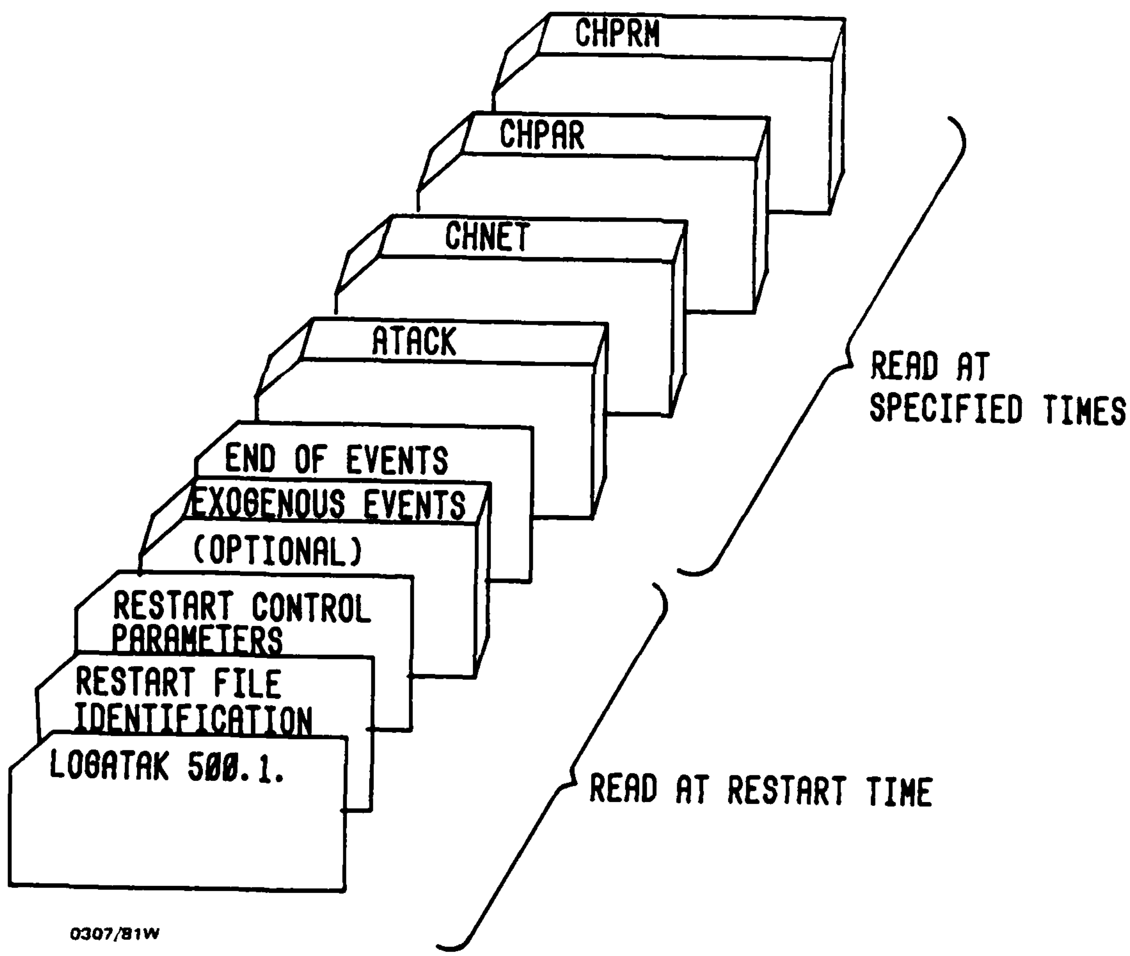

Figure IV-4. Restart Deck Card Setup

14. CDC CONTROL CARDS

The source code for the LOGATAK model is maintained as a CDC UPDATE file on tape. Changes are made to the code utilizing the UPDATE capability and the model is loaded from a binary version of the code stored on the same tape. To save reloading time for each run, an absolute load is stored on a disk file and is used for each model run. The control cards to update the code, load the updated binary routines, and save an absolute load file are shown in Figure IV-5.

The control cards for a standard model run from a cold start are shown in Figure IV-6. A Restart File is created if requested in the model on file TAPE3, and this file can be catalogued to a permanent disc file at the end of the run. The model input data can be read from cards or from an UPDATE data file. Both options are shown in Figure IV-6.

The control cards for a restart model run are shown in Figure IV-7. In this sequence, a restart file at 15 days was used to start the run and a new restart file was created at 30 days. The CATALOG after the exit card is insurance to save a restart file if the model abnormally ends any time after the save run.

```
REQUEST, LGK, VSN = 1111, MT, NORING.

COPYBF (LGK, OLDBIN)

UPDATE (P = LGK, N, R = C)

RUN (S,,, COMPILE,,, 10000)

REWIND, LGO.

REWIND, OLDBIN

COPYL (OLDBIN, LGO, NEWBIN)

REWIND, NEWBIN.

REQUEST, MAW, *PF.

LOAD (NEWBIN)

NOGO.

CATALOG (MAW, LGKABS, ID = LGKAV)
```

Figure IV-5. Update and Load Model Control Cards

INPUT DATA ON CARDS
ATTACH (MAW, LGKABS, ID = LGKAV) REQUEST, TAPE3, *PF. MAW, LC = 100000. CATALOG (TAPE3, RESTART15, ID = LGKAV) EXIT. CATALOG (TAPE3, RESTART15, ID = LGKAV)
INPUT DATA ON UPDATE FILE
ATTACH (OLDPL, LGKDATA, ID = LGKAV) UPDATE (P, C = TAPE5, D, F) ATTACH (MAW, LGKABS, ID = LGKAV) REQUEST, TAPE3, *PF. MAW, LC = 100000, TAPE5. CATALOG (TAPE3, RESTART15, ID = LGKAV)

Figure IV-6. Control Cards to Execute the Model and Save the Restart File

```
ATTACH (RESTRT, RESTART15, ID = LGKAV)
REQUEST, TAPE3, *PF.
COPYBF (RESTRT, TAPE3)
REWIND, TAPE3.
ATTACH (MAW, LGKABS, ID = LGKAV)
MAW, LC = 100000.
CATALOG (TAPE3, RESTART30, ID = LGKAV)
EXIT.
CATALOG (TAPE3, RESTART30, ID = LGKAV)
```

Figure IV-7. Control Cards to Restart the Model

CHAPTER V

LOGATAK REPORTS

1. GENERAL DESCRIPTION

The LOGATAK model produces a set of reports that covers the supply and transportation activities in the model. A standard set of reports is produced when a run is terminated normally. If a model run is terminated abnormally, due to some input data erros, array overflows, or central processor time limit for example, the standard set of reports is also produced. However certain errors, such as illegal data in a card field, are nonrecoverable and the output reports cannot be produced. In addition to the reports at the end of a run, interim reports can be requested at any time during the run by executing subnode 8 of node ZINIT for supply reports and subnode 9 of node ZINIT for transportation reports. These events are scheduled as type 8 exogenous events (see Chapter IV.2.).

In addition to the standard reports, the model produces a limited report when a SAVRUN for restart file is requested, so that the user is aware of the status saved on the restart file. This report is not produce' if a SAVRUN file is requested at the end of a run, that is if TNOW = TFIN, since the standard report is available.

Optional output, in the form of an event by event trace, is available throughout the model run for verification of the model activities. Each of the report types is described in a section in this chapter with sample pages shown.

2. FILES STATUS

The first report produced designates the current status of distribution parameters and file contents. The files in the LOGATAK model are those which store all events waiting to occur in chronological order, arrival queues at terminals, departure queues at terminals and a split shipment working file. The time file is always number 1 and if shipments need to be split into smaller shipments, the working file is number 2. The remaining files are assigned as needed. The numerical assignment is given in the transportation terminal characteristics report. These transportation queues can be scanned to verify what the average and maximum size is and what shipments are currently in the queues. The attribute definitions for the events in the queues and the time file are given in Tables V-1 and V-2. A sample of the Random Variables Parameters report is shown in Figure V-1. The columns contain the values defined in Table IV-9. A sample of the File Printout with 5 files defined is shown in Figure V-2.

3. REPORTS FOR SUPPLY NODES

Supply node reports are produced at the end of a model run and whenever subnode 8 of node ZINIT is executed.

3.1 Demand Generation Nodes Report

The status of each demand generation node (DSB01 to DSB20) that is active in the model is printed out for each item or class of supply ordered. Figure V-3 shows a sample page of this report. Statistics are shown for orders generated and orders received. In this sample for DSB06, supply class 10, ten orders have been generated for 1,130 metric tons. The average order size was 113 tons with the smallest being 113 and the largest 113. The time weighted average quantity due in from supply was 31.17 tons and the due in level was never greater than 226 tons. The average duration of due ins or order and ship time was .423 days with the slowest shipment requiring .872 days. To this point in simulated time, 9 shipments have been received with a total of 1,017 tons. All of the shipments ranged were 113 tons each in size.

3.2 Intermediate Supply Nodes Report

The stock status and demand satisfaction are reported for each intermediate supply node (ASB01 to ASB05) which is active. Figure V-4 shows a sample report for 2 ASB nodes. The serviceable balance on hand for

TABLE V-1. TRANSPORTATION SHIPMENT ATTRIBUTES

ATTRIBUTE	DESCRIPTION
1	TIME OF OCCURRENCE
2	CURRENT LOCATION TERMINAL + PAKTRM * IMMEDIATE DESTINATION TERMINAL
3	FINAL DESTINATION TERMINAL + 1000. * POINTER TO SHIPMENT REQUESTOR
4	DEMAND STATUS + 1000. * ITEM/CLASS IDENTIFIER
5	NUMBER OF ITEMS/UNITS OF MATERIAL IN SHIPMENT
6	PRIORITY
7	UP TO FOUR LINK NUMBERS OF SHIPMENT ROUTING, PACKED BY FACTOR OF PAKLNK
8	REQUIRED DELIVERY DATE
9	ORDER NUMBER
10	TIME THAT ORDER ORIGINATED
11	WEIGHT OF THE SHIPMENT

TABLE V-2. CHNET, ATACK, REBUILD EVENT ATTRIBUTES

ATTRIBUTE	DESCRIPTION
1	TIME OF OCCURRENCE
2	LINK NUMBER IF LESS THAN 100000 TERMINAL NUMBER IF FIRST 5 DIGITS ARE 0 LINK DESIGNATION BY TERMINAL END POINTS OTHERWISE (TERMINAL + 100000 * TERMINAL)
3	TYPE OF ACTION -1 DEACTIVATE 0 ACTIVATE +1 ACTIVATE 2 REBUILD 3 ATTACK
4	NEW RATE OF TRAVEL ON LINK
5	NEW CAPACITY OF LINK/TERMINAL
6	PROBABILITY OF DESTRUCTION
7	TIME TO REBUILD
8	NEW LENGTH OF LINK

N24LOGATAK MODEL ** ANALYST..THE BDM CORP
DATE. 07 27 2219
SUMMARY OUTPUT RUN NAME.N24AO-10-1[illegible]D+6
RUN NO. 1 TNOW 336.000

	TOTAL	WGTD SUM	MEAN	STD DEV	MIN	MAX
LINK NUMBER 1 WORKLOADS, TERMINALS (1, 248)						
AVG. CAPACITY OF LINK	.33600E+03	.33600E+08	.10000E+06	0.	.10000E+06	.10000E+06
AVG. MTON ON LINK NO.	.33619E+03	.36469E+06	.11180E+04	.24781E+04	0.	.11010E+05
TOTAL MTON OVER LINK	.6[illegible]E+05					
LINK NUMBER 2 WORKLOADS, TERMINALS (2, 185)						
AVG. CAPACITY OF LINK	.33600E+03	.33600E+08	.10000E+06	0.	.10000E+06	.10000E+06
AVG. MTON ON LINK NO.	.33414E+03	.92200E+05	.27595E+03	.96633E+03	0.	.56700E+04
TOTAL MTON OVER LINK	.4[illegible]E+05					
LINK NUMBER 3 WORKLOADS, TERMINALS (3, 186)						
AVG. CAPACITY OF LINK	.33600E+03	.33600E+08	.10000E+06	0.	.10000E+06	.10000E+06
AVG. MTON ON LINK NO.	.33484E+03	.11800E+07	.35259E+04	.81898E+04	0.	.35085E+05
TOTAL MTON OVER LINK	.14696E+06					
LINK NUMBER 4 WORKLOADS, TERMINALS (6, 274)						
AVG. CAPACITY OF LINK	.33600E+03	.33600E+08	.10000E+06	0.	.10000E+06	.10000E+06
AVG. MTON ON LINK NO.	.32493E+03	.98238E+04	.30280E+02	.33121E+03	0.	.37200E+04
TOTAL MTON OVER LINK	.6[illegible]E+05					
LINK NUMBER 5 WORKLOADS, TERMINALS (6, 107)						
AVG. CAPACITY OF LINK	.33600E+03	.33670E+08	.10000E+06	0.	.10000E+06	.10000E+06
AVG. MTON ON LINK NO.	.33[illegible]E+03	.5[illegible]73E+05	.1[illegible]34E+03	.6[illegible]17E+0[illegible]	0.	.73650E+04
TOTAL MTON OVER LINK	.5[illegible]E+05					
LINK NUMBER 6 WORKLOADS, TERMINALS (7, 115)						
AVG. CAPACITY OF LINK	.33600E+03	.33600E+08	.10000E+06	0.	.10000E+06	.10000E+06
AVG. MTON ON LINK NO.	.37167E+03	.37483E+04	.10095E+02	.14087E+03	0.	.39750E+04
TOTAL MTON OVER LINK	.21410E+05					
LINK NUMBER 7 WORKLOADS, TERMINALS (7, 116)						
AVG. CAPACITY OF LINK	.33600E+03	.33600E+08	.10000E+06	0.	.10000E+06	.10000E+06
AVG. MTON ON LINK NO.	.37417E+03	.11222E+04	.[illegible]E+01	.10413E+03	0.	.22600E+04
TOTAL MTON OVER LINK	.4[illegible]E+05					
LINK NUMBER 8 WORKLOADS, TERMINALS (8, 124)						
AVG. CAPACITY OF LINK	.33600E+03	.33600E+08	.10000E+06	0.	.10000E+06	.10000E+06
AVG. MTON ON LINK NO.	.3[illegible]E+03	.2[illegible]E+04	.8[illegible]E+01	.[illegible]E+03	0.	.24000E+04
TOTAL MTON OVER LINK	.6[illegible]E+05					
LINK NUMBER 9 WORKLOADS, TERMINALS (8, [illegible])						
AVG. CAPACITY OF LINK	.33600E+03	.33600E+08	.10000E+06	0.	.10000E+06	.10000E+06
AVG. MTON ON LINK NO.	.3[illegible]E+03	.[illegible]E+0[illegible]	.1[illegible]E+01	.[illegible]E+0[illegible]	0.	.1[illegible]E+04
TOTAL MTON OVER LINK	[illegible]					
LINK NUMBER 10 WORKLOADS, TERMINALS (9, 9[illegible])						
AVG. CAPACITY OF LINK	.33600E+03	.33600E+08	.10000E+06	0.	.10000E+06	.10000E+06
AVG. MTON ON LINK NO.	.33245E+03	.146[illegible]E+0[illegible]	.4[illegible]E+0[illegible]	.12[illegible]E+04	0.	.8[illegible]E+04
TOTAL MTON OVER LINK	.7[illegible]E+05					

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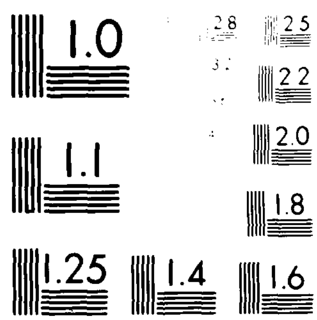
Figure V-1. Random Variables Parameters Sample Report

AD-A108 736 BDM CORP MCLEAN VA F/G 15/[illegible]
A USER'S GUIDE FOR LOGATAK, A SIMULATION MODEL TO ANALYZE LOGIS--ETC(U)
APR 81 E J BITINAS, W F LYNCH DNA001-79-C-0086
UNCLASSIFIED BDM/W-81-079-TR DNA-6505H NL

2 OF 2
AD A
108736

END
DATE
FILMED
01-82
DTIC


1.0
2.8
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

FILE PRINTOUT, FILE NO. 20

AVERAGE NUMBER IN FILE WAS 3.[illegible]
STD. DEV. 5.5361
MAXIMUM 13

FILE CONTENTS

106.99	194163.00	-11.00	2019.00	2.00	201317.00***********	0.00	16.00	96.00	204.00***********
107.94	193143.00	-11.00	2019.00	3.00	201322.00***********	0.00	16.00	96.00	180.00***********
109.98	193143.00	-11.00	3019.00	1.00	201323.00***********	0.00	16.00	96.00	56.00***********
103.86	193117.00	-11.00	7019.00	2.00	201327.00***********	0.00	16.00	96.00	204.00***********
110.86	193117.00	-11.00	2019.00	3.00	201332.00***********	0.00	16.00	96.00	180.00***********
105.86	193117.00	-11.00	3019.00	1.00	201333.00***********	0.00	16.00	96.00	56.00***********
105.86	193117.00	-11.00	4019.00	1.00	201334.00***********	0.00	16.00	96.00	77.00***********
106.86	193117.00	-11.00	7019.00	2.00	201337.00***********	0.00	16.00	96.00	204.00***********
107.86	193117.00	-11.00	3019.00	3.00	201343.00***********	0.00	16.00	96.00	168.00***********
108.86	193117.00	-11.00	7019.00	2.00	201347.00***********	0.00	16.00	96.00	204.00***********
109.85	193117.00	-11.00	4019.00	2.00	201354.00***********	0.00	16.00	96.00	154.00***********
110.85	193117.00	-11.00	7019.00	2.00	201357.00***********	0.00	16.00	96.00	204.00***********
111.85	193117.00	-11.00	4019.00	1.00	201364.00***********	0.00	16.00	96.00	77.00***********

FILE PRINTOUT, FILE NO. 21

AVERAGE NUMBER IN FILE WAS .2649
STD. DEV. .4413
MAXIMUM 3

FILE CONTENTS

111.85	200209.00	13.00	2019.00	4.00	201232.00***********	0.00	10.00	96.00	180.00***********

FILE PRINTOUT, FILE NO. 22

AVERAGE NUMBER IN FILE WAS .2553
STD. DEV. .4360
MAXIMUM 2

FILE CONTENTS

105.00	12043.00	12.00	3019.00	1.00	201113.00	10.00	0.00	15.00	96.00	50.00***********

FILE PRINTOUT, FILE NO. 23

AVERAGE NUMBER IN FILE WAS .6402
STD. DEV. 1.1587
MAXIMUM 3

FILE CONTENTS

115.38	292355.00	-11.00	7019.00	2.00	201517.00***********	0.003050018.00		96.00	204.00***********
116.38	292355.00	-11.00	7019.00	2.00	201527.00***********	0.00	18.00	96.00	204.00***********
116.23	185143.00	11.00	7019.00	2.00	201737.00***********	0.00	17.00	96.00	204.00***********

FILE PRINTOUT, FILE NO. 24

AVERAGE NUMBER IN FILE WAS .3574
STD. DEV. .8928
MAXIMUM 6

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FILE CONTENTS

Figure V-2. File Contents Sample Report

** N24LOGSTAK MODEL **

ANALYST..THE [illegible]
DATE. 07 [illegible]
RUN NAME.[illegible]
TFO. [illegible]

SUMMARY OUTPUT
RUN NO. 1

	TOTAL	WGTD SUM	MEAN	ST. DEV	MIN	MAX
DEMAND GENERATION NODE DSS 5 STATISTICS FOR ITEM 1.						
DURATION OF DUE INS FROM SUPPLY	.21[illegible]E+02	.1[illegible]E+04	.745835E+02	.2[illegible]E+02	[illegible]	.111[illegible]E+03
SUPPLY RCTS (TOT).AND QTY RECEIVED(WSUM)	.70000E+01	.21000E+02	.30000E+01	.23299E+01	.10000E+01	.60000E+01
DEMAND GENERATION NODE DSS 5 STATISTICS FOR ITEM 4.						
DURATION OF DUE INS FROM SUPPLY	.3[illegible]00E+02	.37030E+04	.94956E+02	.24157E+02	.21127E+02	.1[illegible]E+03
SUPPLY RCTS (TOT).AND QTY RECEIVED(WSUM)	.2[illegible]00E+02	.34000E+02	.15000E+01	.50000E+00	.10000E+01	.2[illegible]E+01
DEMAND GENERATION NODE DSB05 STATISTICS FOR ALL ITEMS						
DURATION OF DUE INS FROM SUPPLY	.95000E+02	.76653E+04	.80688E+02	.35451E+02	.19627E+02	.14[illegible]E+03
SUPPLY RCTS (TOT).AND QTY RECEIVED(WSUM)	.45000E+02	.95000E+02	.13388E+01	.12521E+01	.1[illegible]E+01	.6[illegible]E+01
DEMAND GENERATION NODE DSB06 STATISTICS FOR ITEM 1.						
DURATION OF DUE INS FROM SUPPLY	.94000E+02	.83157E+04	.88465E+02	.33732E+02	.37478E+02	.1741[illegible]E+03
SUPPLY RCTS (TOT).AND QTY RECEIVED(WSUM)	.38000E+02	.94000E+02	.24737E+01	.96619E+00	.10000E+01	.40000E+01
DEMAND GENERATION NODE DSB06 STATISTICS FOR ITEM 2.						
DURATION OF DUE INS FROM SUPPLY	.57000E+02	.50472E+04	.88548E+02	.35162E+02	.43259E+02	.17268E+03
SUPPLY RCTS (TOT).AND QTY RECEIVED(WSUM)	.35000E+02	.57000E+02	.16286E+01	.92646E+00	.10000E+01	.30000E+01
DEMAND GENERATION NODE DSB06 STATISTICS FOR ITEM 3.						
DURATION OF DUE INS FROM SUPPLY	.59000E+02	.57354E+04	.97210E+02	.41816E+02	.43596E+02	.18608E+03
SUPPLY RCTS (TOT).AND QTY RECEIVED(WSUM)	.22000E+02	.59000E+02	.26818E+01	.[illegible]313E+01	.10000E+01	.60000E+01
DEMAND GENERATION NODE DSB06 STATISTICS FOR ITEM 4.						
DURATION OF DUE INS FROM SUPPLY	.94000E+02	.88913E+04	.94589E+02	.27653E+02	.43646E+02	.16426E+03
SUPPLY RCTS (TOT).AND QTY RECEIVED(WSUM)	.67000E+02	.94000E+02	.14030E+01	.49050E+00	.10000E+01	.20000E+01
DEMAND GENERATION NODE DSB06 STATISTICS FOR ITEM 10.						
SUPPLY ORDS GEN(TOT).AND QTY ORD(WSUM)	.10000E+02	.11300E+04	.11300E+03	0.	.11300E+03	.11300E+03
QUANTITY DUE IN FROM SUPPLY	.321655E+03	.10240E+05	.31177E+02	.57159E+0[illegible]	0.	.226[illegible]E+03
DURATION OF DUE INS FROM SUPPLY	.10170E+04	.10340E+05	.10167E+02	.39650E+01	.66582E+01	.20934E+02
SUPPLY RCTS (TOT).AND QTY RECEIVED(WSUM)	.90000E+01	.10170E+04	.11300E+03	0.	.11300E+03	.11300E+03

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Figure V-3. Demand Generation Nodes Sample Report

```
                       **     N24LOGATAR   MODEL      **              ANALYST.,THE BDM CORP
                                                                      DATE.      0/  2/ 2219
                                SUMMARY OUTPUT                        RUN NAME.N24AB-10-1500+6
                                 RUN NO.  1                           TNOW       336.000

STOCKAGE STATISTICS FOR SUPPLY ACTIVITIES AT NODE ASB01, ITEM     10.

                                           TOTAL     WGTD SUM      MEAN      STD DEV       MIN          MAX
SERVICEABLE BALANCE ON HAND              .32439E+03  .61231E+06  .18875E+04  .41824E+03  .86500E+03  .23230E+04
CURRENT BALANCE ON HAND                  .15940E+04

DEMAND STATISTICS FOR SUPPLY ACTIVITIES AT NODE ASB01, ITEM     10., SECONDARY FUNCTION TYPE  0.

DEMANDS RECEIVED (TOT), AND QTY (QSUM)   .10000E+02  .24300E+04  .24300E+03 0.           .24300E+03  .24300E+03
DEMANDS COMPLETELY FILLED(TOT)AND QTY(WSM) .10000E+02 .24300E+04 .24300E+03 0.          .24300E+03  .24300E+03
PCT COMPLETE FILL, DEMANDS                 100.00000
PCT COMPLETE FILL, QUANTITY                100.00000

STOCKAGE STATISTICS FOR SUPPLY ACTIVITIES AT NODE ASB01, ITEM     11.

SERVICEABLE BALANCE ON HAND              .32397E+03  .70513E+06  .21765E+04  .39837E+03  .13890E+04  .26290E+04
CURRENT BALANCE ON HAND                  .21330E+04

DEMAND STATISTICS FOR SUPPLY ACTIVITIES AT NODE ASB01, ITEM     11., SECONDARY FUNCTION TYPE  0.

DEMANDS RECEIVED (TOT), AND QTY (QSUM)   .90000E+01  .22320E+04  .24800E+03 0.           .24800E+03  .24800E+03
DEMANDS COMPLETELY FILLED(TOT)AND QTY(WSM) .90000E+01 .22320E+04 .24800E+03 0.          .24800E+03  .24800E+03
PCT COMPLETE FILL, DEMANDS                 100.00000
PCT COMPLETE FILL, QUANTITY                100.00000

STOCKAGE STATISTICS FOR SUPPLY ACTIVITIES AT NODE ASB02, ITEM     10.

SERVICEABLE BALANCE ON HAND              .33165E+03  .15473E+07  .46654E+04  .13907E+03  .44880E+04  .48270E+04
CURRENT BALANCE ON HAND                  .47010E+04

DEMAND STATISTICS FOR SUPPLY ACTIVITIES AT NODE ASB02, ITEM     10., SECONDARY FUNCTION TYPE  0.

DEMANDS RECEIVED (TOT), AND QTY (QSUM)   .10000E+02  .11300E+04  .11300E+03 0.           .11300E+03  .11300E+03
DEMANDS COMPLETELY FILLED(TOT)AND QTY(WSM) .10000E+02 .11300E+04 .11300E+03 0.          .11300E+03  .11300E+03
PCT COMPLETE FILL, DEMANDS                 100.00000
PCT COMPLETE FILL, QUANTITY                100.00000

STOCKAGE STATISTICS FOR SUPPLY ACTIVITIES AT NODE ASB02, ITEM     11.

SERVICEABLE BALANCE ON HAND              .33413E+03  .17178E+07  .51412E+04  .13086E+03  .48190E+04  .52750E+04
CURRENT BALANCE ON HAND                  .49[illegible]40E+04
```

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Figure V-4. Intermediate Supply Node Sample Report

ASB01, item 10, ranged from a low of 865 tons to a high of 2,323 tons. The node received 10 demands for 2,430 tons and filled 10 of those demands for 2,430 tons. The percent of demands filled was 100%.

4. TRANSPORTATION SYSTEM REPORT

The transportation system report consists of five different subreports. First the current status of the network is printed out with all links specified by their end terminals and their characteristics. The column labeled CAPACITY is the maximum number of metric tons that can be placed on the link during any given interval of time equal to the travel time across the link. The capacity per day of the link is also shown. A sample page of this report is shown in Figure V-5. The next section of the report prints the current characteristics of the terminals in the network and any queue assignments that have been made. A sample page of this report is shown in Figure V-6.

The workloads measured at each terminal that was utilized in the network are printed in the next section of the report, as shown in Figure V-7. The average capacity and average number of metric tons in the terminal is shown. The total number of metric tons passing through the terminal to this point is shown. Finally the average size of arrival and departure queues, if any, are shown. The link workloads are presented in a similar fashion as shown in Figure V-8. The flow pattern experienced in a network can be readily visualized when the tonnage over each link is transferred to a map.

The final workloads report (Figure V-9) is presented by mode of travel, reporting the metric ton kilometer utilization for each mode. The most common definition of mode codes is as follows:

1 - Air
2 - Sea
3 - Rail
4 - Highway
5 - Inland Waterway
6 - Transshipment

** FORCATAK MODEL ** ANALYST, BDM CORP
DATE, 1/ 28/ 1981
SUMMARY OUTPUT RUN NAME, TRANS MOBILIZATION
RUN NO, 1 TNOW 140,417
*** TRANSPORTATION SYSTEM REPORT ***

TRANSPORTATION NETWORK

NUMBER OF TERMINALS = 345

LINKS SPECIFIED BY TERMINAL NUMBERS

LINK NO.	FROM	TO	MODE	LENGTH	RATE	CAPACITY	CAP. PER HOUR	PCNT. DES.	REBLD. TIME
1	1	343	3	1.0	5.0	10.0	50.0	0.0000	0.0
2	2	345	3	1.0	5.0	10.0	50.0	0.0000	0.0
3	6	220	4	1.0	416.6	40.0	16665.0	0.0000	0.0
4	6	217	3	1.0	5.0	10.0	50.0	0.0000	0.0
5	7	189	4	1.0	416.6	40.0	16665.0	0.0000	0.0
6	7	183	3	1.0	5.0	10.0	50.0	0.0000	0.0
7	11	106	4	.5	416.6	20.0	16665.0	0.0000	0.0
8	11	96	3	.5	5.0	5.0	50.0	0.0000	0.0
9	12	112	4	.5	416.6	20.0	16665.0	0.0000	0.0
10	12	105	3	.5	5.0	5.0	50.0	0.0000	0.0
11	13	136	4	.5	416.6	20.0	16665.0	0.0000	0.0
12	13	134	3	.5	5.0	5.0	50.0	0.0000	0.0
13	14	83	4	1.0	416.6	40.0	16665.0	0.0000	0.0
14	15	99	4	1.0	416.6	40.0	16665.0	0.0000	0.0
15	34	35	6	5.0	5.0	106.7	106.7	0.0000	0.0
16	34	50	3	105.0	48.0	1050.0	480.0	0.0000	0.0
17	36	59	4	35.0	16.0	1400.0	640.0	0.0000	0.0
18	36	73	4	10.0	32.0	400.0	1280.0	0.0000	0.0
19	36	37	4	34.0	32.0	1360.0	1280.0	0.0000	0.0
20	37	74	4	40.0	32.0	1600.0	1280.0	0.0000	0.0
21	37	52	4	6.0	16.0	240.0	640.0	0.0000	0.0
22	39	43	4	31.0	16.0	1240.0	640.0	0.0000	0.0
23	39	74	4	24.0	32.0	960.0	1280.0	0.0000	0.0
24	39	39	4	20.0	32.0	800.0	1280.0	0.0000	0.0
25	37	41	4	45.0	32.0	1800.0	1280.0	0.0000	0.0
26	32	40	4	17.0	16.0	680.0	640.0	0.0000	0.0
27	40	77	4	14.0	16.0	560.0	640.0	0.0000	0.0
28	40	41	4	41.0	16.0	1640.0	640.0	0.0000	0.0
29	41	99	4	55.0	24.0	2200.0	960.0	0.0000	0.0
30	41	42	4	135.0	24.0	5400.0	960.0	0.0000	0.0
31	42	107	1	34.0	24.0	1360.0	960.0	0.0000	0.0
32	42	92	4	74.0	24.0	2960.0	960.0	0.0000	0.0
33	43	36	3	276.0	18.0	2760.0	480.0	0.0000	0.0
34	43	105	3	141.0	48.0	1410.0	480.0	0.0000	0.0
35	43	44	6	5.0	5.0	106.7	106.7	0.0000	0.0
36	45	115	4	77.0	24.0	3080.0	960.0	0.0000	0.0
37	45	112	4	86.0	32.0	3440.0	1280.0	0.0000	0.0
38	46	47	4	104.0	24.0	4160.0	960.0	0.0000	0.0
39	46	47	4	57.0	24.0	2280.0	960.0	0.0000	0.0
40	47	116	4	112.0	24.0	4480.0	960.0	0.0000	0.0
41	47	12	4	68.0	32.0	2720.0	1280.0	0.0000	0.0
42	47	49	4	79.0	24.0	3160.0	960.0	0.0000	0.0
43	46	5[illegible]	3	25.0	48.0	950.0	480.0	0.0000	0.0
44	48	51	3	48.0	48.0	180.0	480.0	0.0000	0.0
45	49	55	1	80.0	32.0	2560.0	1280.0	0.0000	0.0

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Figure V-5. Sample Network Link Report

** N24LOGAYAK MODEL **

SUMMARY OUTPUT
RUN NO. 1

ANALYST..THE BDM CORP
DATE. 0/ 2/ 2219
RUN NAME.N24A0-10-150D+6
TNOW 336.000

TERMINAL CHARACTERISTICS

TERM.NO.	MODE	CAPACITY	ARRVL.Q	DEPRT.Q	TERM.NO.	MODE	CAPACITY	ARRVL.Q	DEPRT.Q
1	4	10000.0	0	0	2	4	10000.0	0	0
3	4	10000.0	0	0	4	4	10000.0	0	0
5	4	10000.0	0	0	6	4	10000.0	0	0
7	4	10000.0	0	0	8	4	10000.0	0	0
9	4	10000.0	0	0	10	4	10000.0	0	0
11	4	10000.0	0	0	12	4	10000.0	0	0
13	4	10000.0	0	0	14	4	10000.0	0	0
15	4	10000.0	0	0	16	4	10000.0	0	0
17	4	10000.0	0	0	18	4	10000.0	0	0
19	4	10000.0	0	0	20	4	10000.0	0	0
21	4	10000.0	0	0	22	4	10000.0	0	0
23	4	10000.0	0	0	24	4	10000.0	0	0
25	4	10000.0	0	0	26	4	10000.0	0	0
27	4	10000.0	0	0	28	4	10000.0	0	0
29	4	10000.0	0	0	30	4	10000.0	0	0
31	4	10000.0	0	0	32	4	10000.0	0	0
33	3	3000.0	0	0	34	4	1250.0	0	0
35	4	2500.0	0	0	36	4	1000.0	0	0
37	3	3000.0	0	0	38	3	4500.0	80	0
39	3	3000.0	0	0	40	3	1500.0	0	0
41	3	1500.0	93	0	42	3	1500.0	0	0
43	3	1500.0	0	0	44	3	1500.0	212	0
45	4	5000.0	171	173	46	4	2500.0	176	0
47	4	2500.0	0	0	48	4	2500.0	0	0
49	4	1000.0	0	0	50	3	1500.0	0	0
51	3	1500.0	0	0	52	3	1500.0	0	0
53	3	1500.0	0	0	54	3	3000.0	77	0
55	4	5000.0	249	0	56	4	5000.0	164	0
57	4	2500.0	261	0	58	4	2500.0	0	0
59	4	500.0	0	0	60	4	500.0	0	0
61	4	500.0	0	0	62	4	500.0	0	0
63	4	5000.0	0	0	64	4	2500.0	167	253
65	4	5000.0	0	0	66	3	1500.0	0	0
67	3	1500.0	0	0	68	3	1500.0	0	0
69	3	1500.0	0	0	70	3	1500.0	0	0
71	3	1500.0	0	0	72	3	1500.0	0	0
73	4	500.0	0	0	74	4	500.0	0	0
75	4	500.0	0	0	76	4	500.0	0	0
77	4	5000.0	0	0	78	4	5000.0	0	0
79	4	1500.0	0	0	80	4	1500.0	0	0
81	3	1500.0	0	0	82	3	15000.0	0	0
83	4	5000.0	0	0	84	3	3000.0	0	0
85	3	7500.0	0	0	86	3	4500.0	0	0
87	4	1000.0	0	0	88	4	250.0	262	0
89	4	1500.0	0	0	90	4	1000.0	0	0
91	4	1000.0	0	0	92	4	1000.0	0	0
93	4	2500.0	0	0	94	3	4500.0	70	[illegible]
95	3	4500.0	0	0	96	3	15000.0	0	0
97	3	7500.0	67	52	98	3	4500.0	72	0
99	3	3000.0	0	0	100	4	1500.0	0	0
101	4	1000.0	0	0	102	4	500.0	0	[illegible]
103	4	1500.0	[illegible]	[illegible]	104	4	5000.0	[illegible]	0

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Figure V-6. Sample Network Terminal Report

** N24LOGATAK MODEL **

ANALYST..THE BDM CORP
DATE. 0/ 2/ 2219

SUMMARY OUTPUT
RUN NO. 1

RUN NAME.N24A0-10-150D+6
TNOW 336.000

		TOTAL	WGTD SUM	MEAN	STD DEV	MIN	MAX
	SHPMTS. IN DEPRT QUEUE	.33353E+03	.39547E+02	.11857E+00	.41780E+00	0.	.40000E+01
TERMINAL	116 WORKLOADS						
	AVG. CAPACITY OF TERMINAL	.33600E+03	.50400E+06	.15000E+04	0.	.15000E+04	.15000E+04
	AVG. MTON IN TERMINAL	.33295E+03	.15370E+06	.46164E+03	.13361E+04	0.	.66500E+04
	MTON THROUGH TERMINAL	.26232E+06					
	SHPMTS. IN ARRVL QUEUE	.28345E+03	.43853E+01	.15471E-01	.12342E+00	0.	.20000E+01
	SHPMTS. IN DEPRT QUEUE	.32365E+03	.60691E+01	.18752E-01	.13565E+00	0.	.10000E+01
TERMINAL	117 WORKLOADS						
	AVG. CAPACITY OF TERMINAL	.33600E+03	.50400E+06	.15000E+04	0.	.15000E+04	.15000E+04
	AVG. MTON IN TERMINAL	.33582E+03	.89216E+05	.26567E+03	.10440E+04	0.	.66500E+04
	MTON THROUGH TERMINAL	.17275E+06					
	SHPMTS. IN ARRVL QUEUE	.33494E+03	.11945E+01	.35662E-02	.59611E-01	0.	.10000E+01
	SHPMTS. IN DEPRT QUEUE	.33582E+03	.95743E+00	.28510E-02	.53319E-01	0.	.10000E+01
TERMINAL	118 WORKLOADS						
	AVG. CAPACITY OF TERMINAL	.33600E+03	.67200E+06	.20000E+04	0.	.20000E+04	.20000E+04
	AVG. MTON IN TERMINAL	.31945E+03	.20277E+05	.63467E+02	.50272E+03	0.	.66500E+04
	MTON THROUGH TERMINAL	.81100E+05					
	SHPMTS. IN ARRVL QUEUE	.27671E+03	.10000E-03	.36139E-06	.60116E-03	0.	.10000E+01
TERMINAL	119 WORKLOADS						
	AVG. CAPACITY OF TERMINAL	.33600E+03	.67200E+06	.20000E+04	0.	.20000E+04	.20000E+04
	AVG. MTON IN TERMINAL	.33578E+03	.11004E+06	.32772E+03	.11494E+04	0.	.97456E+04
	MTON THROUGH TERMINAL	.37171E+06					
	SHPMTS. IN ARRVL QUEUE	.33310E+03	.16254E+01	.48795E-02	.69682E-01	0.	.10000E+01
	SHPMTS. IN DEPRT QUEUE	.33512E+03	.60222E+01	.17970E-01	.14068E+00	0.	.20000E+01
TERMINAL	120 WORKLOADS						
	AVG. CAPACITY OF TERMINAL	.33600E+03	.10080E+07	.30000E+04	0.	.30000E+04	.30000E+04
	AVG. MTON IN TERMINAL	.33427E+03	.92811E+05	.27765E+03	.10619E+04	0.	.66500E+04
	MTON THROUGH TERMINAL	.36944E+06					
	SHPMTS. IN ARRVL QUEUE	.30080E+03	.11012E+01	.36608E-02	.60399E-01	0.	.20000E+01
	SHPMTS. IN DEPRT QUEUE	.39129E+03	.17099E+01	.43476E-02	.65793E-01	0.	.10000E+01
TERMINAL	121 WORKLOADS						
	AVG. CAPACITY OF TERMINAL	.33600E+03	.10080E+07	.30000E+04	0.	.30000E+04	.30000E+04
	AVG. MTON IN TERMINAL	.33492E+03	.81700E+05	.24394E+03	.10048E+04	0.	.66500E+04
	MTON THROUGH TERMINAL	.31414E+06					
	SHPMTS. IN ARRVL QUEUE	.31737E+03	.14685E+01	.46208E-02	.67824E-01	0.	.20000E+01
	SHPMTS. IN DEPRT QUEUE	.28840E+03	.83592E+00	.28984E-02	.60609E-01	0.	.20000E+01
TERMINAL	122 WORKLOADS						
	AVG. CAPACITY OF TERMINAL	.33600E+03	.33600E+06	.10000E+04	0.	.10000E+04	.10000E+04
	AVG. MTON IN TERMINAL	.33562E+03	.20785E+06	.61932E+03	.15422E+04	0.	.81500E+04
	MTON THROUGH TERMINAL	.81849E+06					
	SHPMTS. IN ARRVL QUEUE	.31840E+03	.24608E+02	.77288E-01	.38730E+00	0.	.40000E+01
	SHPMTS. IN DEPRT QUEUE	.29414E+03	.15530E+01	.52798E-02	.72470E-01	0.	.10000E+01

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Figure V-7. Sample Terminal Workloads Report

**	FORCATAX	MODEL	**	ANALYST, HDM CORP
				DATE, 17 2H7 1981
	SUMMARY OUTPUT			RUN NAME, TRANS MOBILIZATION
	[illegible]	1		TNIA 100,417

[illegible]	[illegible]	RANDOM VARIABLES PARAMETERS			
1	COST	1.0000	0.0000	0.0000	0.0000
[illegible]	COST	0.3300	0.0000	0.0000	0.0000
31	COST	.5000	0.0000	0.0000	0.0000
32	COST	1.0000	0.0000	0.0000	0.0000
33	COST	1.5000	0.0000	0.0000	0.0000
[illegible]	COST	2.5000	0.0000	0.1000	0.0000
37	COST	0.0000	0.0000	0.0000	0.0000
[illegible]	COST	0.0000	0.0000	0.0000	0.0000
[illegible]	COST	1.0000	0.0000	0.0000	0.0000
[illegible]	COST	.2500	0.0000	0.0000	0.0000
[illegible]	COST	.5000	0.0000	0.0000	0.0000
[illegible]	COST	.7500	0.0000	0.0000	0.0000
[illegible]	COST	1.1000	0.0000	0.0000	0.0000
[illegible]	COST	1.5000	0.0000	0.0000	0.0000
[illegible]	COST	[illegible]	0.0000	0.0000	0.0000
[illegible]	COST	[illegible]	0.0000	0.0000	0.0000
[illegible]	COST	[illegible]	0.0000	0.0000	0.0000
5	COST	1.0000	0.0000	0.0000	0.0000
51	COST	297.0000	0.0000	0.0000	0.0000
52	COST	297.0000	0.0000	0.0000	0.0000
53	COST	297.0000	0.0000	0.0000	0.0000
54	COST	297.0000	0.0000	0.0000	0.0000
55	COST	297.0000	0.0000	0.0000	0.0000
[illegible]	COST	[illegible]	0.0000	0.0000	0.0000
[illegible]	COST	222.0000	0.0000	0.0000	0.0000
[illegible]	COST	[illegible]	0.0000	0.0000	0.0000
[illegible]	COST	225.0000	0.0000	0.0000	0.0000
[illegible]	COST	[illegible]	0.0000	0.0000	0.0000
	COST	0.0000	1.0000	0.0000	0.0000

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Figure V-8. Sample Link Workloads Report

```
         **   N24LOGATAK   MODEL    **                 ANALYST..THE BDM CORP
                                                       DATE.     0/  2/ 2219
                SUMMARY OUTPUT                         RUN NAME.N24AB-10-15QD+6
                 RUN NO.   1                           TNOW      336.000

MODE WORKLOADS

                                    TOTAL      WGTD SUM      MEAN     STD DEV        MIN         MAX
     MTON  KM    ON MODE     3.   .95424E+09
     MTON  KP    ON MODE     4.   .88183E+09
     MTON  KM    ON MODE     6.   .14512E+08
```

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Figure V-9. Sample Mode Utilization Report

5. PERMANENT ATTRIBUTES REPORT

At the end of the run, all supply parameters stored in the array PERMAT are printed out for each supply node. These attributes were defined in Tables IV-6, IV-7, and IV-8. A sample page for node DSB01 is shown in Figure V-10. This node handles eight different supply classes, 2, 3, 4, 5, 6, 7, 10 and 11. For statistical indices that have been utilized, the position in the statistics data storage arrays is packed in with the type of statistic. For example, attribute 8 of SIUNOD for class 2 shows that this is a COLCT type statistic (3) and the values are stored in location 22 of the COLCT arrays. If a location has not been assigned, i.e., there is a single digit as input, then the statistic has not been activated yet.

6. SAVRUN FOR RESTART

Whenever a SAVRUN is requested to create a file for later restarting of the model, one or more pages is printed out. The first page describes the identification card required to restart the model utilizing this file. If the SAVRUN is not at the end of the model run, additional reports similar to the final reports are produced to clearly define the conditions in the model at that point. Only the last SAVRUN in a model is available on the file since the previous SAVRUN is overwritten. Thus earlier SAVRUNs are created only to recover from premature termination of the model.

7. EVENT TRACE

To aid in debugging the model and checking the input data parameters and model logic, an event trace is provided in the model. This trace is optional and may be turned on or off at any time during the model run. This capability is controlled through exogenous events of type -2. The trace provides an event by event history of all activity in the model duri the tim the trace is activated. Each module that is used during

** FORCATAR MODEL **

SUMMARY OUTPUT

RUN NO. 1

ANALYST, BDM CORP

DATE, 1/ 28/ 1981

RUN NAME, TRANS MOBILIZATION

TNOW 140,417

PERMANENT ATTRIBUTES FOR [illegible] OF DSR01 , PAGE 1

FUNCT.	[illegible] NODE	....1..	....2..	....3..	....4..	....5..	....6..	....7..	....8..	....9..
$1[illegible]	2.	50.00	80.00	0.00	0.00	0.00	0.00	0.00	223.00	233.00
$1[illegible]	3.	50.00	80.00	0.00	0.00	0.00	0.00	0.00	283.00	293.00
$1[illegible]	4.	50.00	80.00	0.00	0.00	0.00	0.00	0.00	263.00	273.00
$1[illegible]	5.	50.00	81.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00
$1[illegible]	6.	50.00	80.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00
$1[illegible]	7.	50.00	80.00	0.00	0.00	0.00	0.00	0.00	323.00	333.00
$1[illegible]	10.	50.00	51.00	0.00	0.00	0.00	3.00	3.00	3.00	3.00
$1[illegible]	11.	50.00	61.00	0.00	0.00	0.00	3.00	3.00	3.00	3.00
$A[illegible]	[illegible]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	243.00	253.00
NODE	[illegible]	24.00	1.00							

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Figure V-10. Sample Permanent Attributes Report the event is listed by name to aid in following the logical path followed. A sample page from a trace is shown in Figure V-11. This page shows three complete events and a portion of two others. Each event starts with a set of attributes removed from the time file. The attributes have been defined in Tables V-1 and V-2. The sample shows a departure event, an arrival event, and a supply delivery.

```
REMOVE NO.   1  000000000037000000067
   76.71  215217.0    13.0   7019.0      4.0 101427.0  195308333331.       0.00 2170004.00     72.00     408.00

OPRTS
FILE   NO.   5  000000000037000000067
   76.71  215217.0    13.0   7019.0      4.0 101427.0  195308333331.       0.00 2170004.00     72.00     408.00

RETLNG CALLED OFF TOP OF STACK  IZNODE..   31 IZVERB..  107

**********.************ CURRENT EVENT .....TIME =   76.71    NODE TRANS           ******************************
**********.************    NEXT EVENT .....TIME =   76.83    NODE TRANS           ******************************
REMOVE NO.   1  000000000037000010116
   76.83   11100.0    11.0   7019.0      4.0 101267.0             7.      0.00      7.00     72.00     408.00

OPRTQ
        PARAMETER SLOT   1 CALLED ,CONTROLLED BY P10107
MOVEL
        PARAMETER SLOT   1 CALLED ,CONTROLLED BY P10109

DELAY (PB   0 )
FILE   NO.   1  000000000037000010116
   76.83   11100.0    11.0   7019.0      4.0 101267.0             7.      0.00      7.00     72.00     408.00

**********.************ CURRENT EVENT .....TIME =   76.83    NODE TRANS           ******************************
**********.************    NEXT EVENT .....TIME =   76.83    NODE TRANS           ******************************
REMOVE NO.   1  000000000037000010116
   76.83   11100.0    11.0   7019.0      4.0 101267.0             7.      0.00      7.00     72.00     408.00

ANNVS
        PARAMETER SLOT   1 CALLED ,CONTROLLED BY P10110
YBRJP
        PARAMETER SLOT   1 CALLED ,CONTROLLED BY P10112

DELAY (PB   0 )
FILE   NO.   1  000000000037000010116
   76.83   11100.0    11.0   7019.0      4.0 101267.0             7.      0.00      7.00     72.00     408.00

**********.************ CURRENT EVENT .....TIME =   76.83    NODE TRANS           ******************************
**********.************    NEXT EVENT .....TIME =   76.83    NODE TRANS           ******************************
REMOVE NO.   1  000000000037000010116
   76.83   11100.0    11.0   7019.0      4.0 101267.0             7.      0.00      7.00     72.00     408.00
DELVS
        PARAMETER SLOT   1 CALLED ,CONTROLLED BY P10113

RFL3W
RFL3W FIRED OFF TOP OF STACK, NODE,   31VERB,    0

**********.************ CURRENT EVENT .....TIME =   76.83    NODE TRANS           ******************************
**********.************    NEXT EVENT .....TIME =   77.00    NODE TRANS           ******************************
REMOVE NO.   1  [illegible]
   77.00   31722.     13.0   [illegible]      2.0 111426.0   333331336.       6.00      4.00     72.00     348.00

ARRVQ
REMOVE [illegible]   2  [illegible]
   75.[illegible]   31722.     13.[illegible]   [illegible]      2.[illegible] 101126.[illegible]  [illegible]333331336.     [illegible]     4.00     72.[illegible]     348.00
        PARAMETER SLOT   2 CALLED ,CONTROLLED BY P10[illegible]

RTURN (PB   )
FILE [illegible]   1  [illegible]
   77.[illegible]   31722.     13.[illegible]   [illegible]      2.[illegible] [illegible]126.[illegible]  308333331336.     [illegible]     4.00     72.[illegible]     348.00
        PARAMETER SLOT   1 CALLED ,CONTROLLED BY P10[illegible]
TRMIP

OJSTQ

OJSTR
```
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Figure V-11. Sample Page from Event Trace

CHAPTER VI
OPERATING STRATEGY

1. GENERAL

The preceding chapters have described various aspects of the LOGATAK computer model, and have presented detailed instructions describing how to operate the various component parts of the model. This chapter ties together the detailed instructions of the previous chapters and presents a number of observations on how the LOGATAK model can be operated to present the most useful simulation of the desired problem. The suggestions presented in this chapter are generally grouped around building the scenario, gathering the required data, running the model, and analyzing the model results.

If one paramount observation could be made concerning the application of the LOGATAK model, it would be this: the number of simulation features available in the model is so large and the ability of the data base to accept information is so great, the model is capable of overwhelming any available computer capacity or program budget. Since it is not technically nor financially feasible to model the whole world, the analyst must necessarily exert censorship on the building of his model. The scenario must be a test of the desired effects. The temptation is always great to include every factor of the logistic system in detail, but this temptation rapidly overwhelms the capability of the computer.

2. SCENARIO

In designing the scenario for a LOGATAK run, the analyst must first determine which factors are significant in the problem he is studying, and which factors are clearly second order variables which will have little or no influence on the final answer. On the face of it, the preceding statement tends to sound like a pre-judgement and pre-determination of the final results of the model run, but such need not be the case. Some careful consideration of the problem before the model is built will usually indicate which effects can be safely suppressed. If the problem to be considered involves a short, rapidly-moving war, factors usually associated with long term attrition such as higher echelon maintenance activities, spare part stocks, and the movement of logistic supplies far behind the battlefront are usually of little significance to the outcome. On the other hand, if the scenario involves a slow campaign of attrition, factors involving battlefield mobility of fighting units are of little consequence. Exceptions exist to every general statement, but the point to be emphasized is that careful forethought will clarify the issues in a problem and safely enable the suppression of some variables as second-order.

The scenario must be carefully constructed to be realistic and to incorporate the desired type of battlefield and logistic operations. Each national military establishment, either friendly or enemy, has individual features of its operations in every activity, such as battlefield tactics, doctrines of ammunition expenditure, doctrines concerning marching order, and doctrines regulating the operation of its logistic system. These factors should be investigated and incorporated into the scenario so that the results will be representative of the operation of the force under consideration.

An important factor in the construction of a scenario is to achieve a proper proportion between the total size of the operational battle force and the capability of the existing physical features of the logistic network, such as terminals and transportation links. The general nature of an interdiction attack which is directed primarily against fixed installations rather than vehicles, for example, is an initial wearing-down of the "surplus capacity" of the logistic network, after which the support to the battle forces begins to deteriorate. For any given part of the world, it can readily be appreciated that the existing transportation network is more than enough to support a very small battlefield force, but insufficient to support an extremely large battlefield force, even without interdictive attack. The absolute size of the battle force selected for the scenario thus becomes an important factor in the apparent success of any interdiction campaign, without consideration of the nature or severity of the interdictive attacks. For this reason special care must be taken to size the supported battle force realistically in terms of the military campaign envisaged. If it is thoughtlessly chosen either excessively large or small, the results of the simulation will be inadvertently biased.

The interdiction plan in the scenario should make best use of weaknesses in the logistic support structure. Frequently a geographic weakness can be found in the form of a "barrier line," either a physical feature such as a river or mountain chain, or a weakness in the man-made logistic network, or a combination of the two factors. If uncertainty exists in a given scenario as to the best choice of logistic barrier, different strategies of attack should be tried in separate computer runs to observe the variation in results. Such preliminary trials can be very useful in improving the effectiveness and realism of the interdiction attacks chosen in the scenario.

3. INPUT DATA

A considerable opportunity exists in the preparation of the data base to eliminate less important information by means of data aggregation. In preparing the data base for a highway system, for example, there are usually roads which are so small and poorly made that their freight capacity is insignificant compared to better roads in the same vicinity. These secondary roads can be aggregated to form theoretical roads whose capacity and rate of travel simulates the combination of more than one actual secondary road. A suggested set of guidelines which were found useful in LOGATAK runs are as follows:

(1) A data base element is subject to aggregation if it is not a worthwhile target of interdictive attack.

(2) Only elements of like character should be aggregated, for example a country road should not be aggregated with a freeway.

(3) The aggregated elements should serve the same general purpose, that is, if they are roads they should run in roughly the same direction and be reasonably close together.

Data base aggregation enables the analyst to simulate the real world to a level of quality adequate for the LOGATAK simulation while at the same time eliminating a great deal of insignificant information before it ever gets into the computer. As will be seen later in Part 5 of this chapter, excessive aggregation of the data base which distorts the final simulation output can easily be reversed, but need be reversed only in the areas where greater detail is significant to the particular simulation. The flexibility in the data base provided by DAMSEL thus encourages the analyst to aggregate apparently insignificant information, since this aggregation is not permanent.

The kill probabilities associated with logistic strikes should obviously be as realistic as possible, since they greatly influence whether a particular interdiction attack has been successful. If a particular model run uses stochastic kill probabilities, the analyst should take care to make a sufficient nubmer of model runs to evaluate scatter in the final results which stems from variation in the stochastic kill probabilities. No hard and fast rules can be made concerning the number of times a run must be repeated to evaluate stochastic effects, but since kill probabilities are one of the few stochastic processes in LOGATAK, the analyst should be alert for this type of problem.

It is important to have accurate estimates of rebuild capability, both the time it takes to rebuild a target, and the degree of restoration in capacity and rate of travel. Interdiction is essentially a race between destruction and rebuild. It doesn't make for a balanced study to put a great deal of effort into estimating probabilities of kill and extent of destruction, and then to input hasty rebuild estimates. The model will accept rebuild estimates in a variety of ways. First, the DAMSEL data base has the capability to store standard rebuild times and capacities for each target which is likely to be attacked. Second, at the time any attack is input to the LOGATAK model, the attack card may contain a modified value of rebuild time and target capacity as rebuilt. Third, even if rebuilt target capacity is changed by the attack card, a subsequent "change net" card can be input to the computer to restore the target capability to the original values or any other values desired. Since there is no limit to the number of change net cards which may be input, the analyst has great flexibility in altering th capability of rebuilt targets as a function of time. This model capability enables the analyst to tailor target rebuilding to match time-varying estimates of rebuild capability.

4. RUNNING THE MODEL

The first point to be made concerning the building of a LOGATAK simulation is that the analyst should not expect a perfect run the first time through. Network problems are complex and there are many interactions between the data base, input assumptions and attack strategies, which sometimes do not mesh well together. As difficulties show up, the analyst should expect to perform a certain amount of fine tuning to the model inputs in order to improve realism in trouble areas.

The use of the save run (SAVRUN) feature in LOGATAK is especially valuable in tuning up the model. The liberal use of the save run feature produces several benefits to the analyst:

(1) Save run permits the analyst to feel his way through the simulation run, looking at intermediate results at frequent intervals to see if trouble is building up. It permits interaction between the analyst and the run as the simulation proceeds and enables the analyst to terminate a run which is not going well, thus saving computing time.

(2) The save run feature permits the printing of ither a supply report, a transportation report, or both, at any point in the run, depending on what types of information the analyst desires.

(3) The save run feature provides comprehensive pictures of the development of the scenario at frequent time intervals, rather than relying on final results only. These intermediate pictures not only aid the analyst in understanding his model, but are also very worthwhile when report time comes.

A useful feature in the LOGATAK model during the early running stage is the ability to put time limits on the runs. This feature supplements the save run feature to save wasted computer time on runs which have gone bad for some reason.

A useful way to begin the validation of a simulation is to perform a baseline run, that is, a runthrough of the scenario with no interdiction attacks. The baseline run provides a perspective of how the logistic system performs the task required by the scenario without interference. For example, because of unusual demands or a weak spot in the logistic system, significant queues may form even without interdiction. A very useful tool in the analysis of the baseline run is to prepare simple flow charts showing the traffic through each link and terminal in the logistic system at various points in time. These simple charts rapidly disclose the existence of unusually heavy traffic or queues. The analyst should be especially sensitive to these points of heavy traffic because they may result either from some element of unrealism inadvertently placed in the model (which should be corrected), or they may point up a deficiency in the real logistic network which can be exploited by an interdictive attack. A "by hand" analysis will determine whether these heavy traffic locations are real choke points or whether they come from unrealism in the input assumptions.

As indicated in Part 3, variations in stochastic kill probabilities will sometimes influence the results obtained from model runs in peculiar ways. The analyst should be on the look-out for unusual results of this type which do not reflect long term realism.

5. ANALYZING THE MODEL RESULTS

In reviewing the results of the model runs, the analyst should keep several factors in mind. In a model as complex as LOGATAK, many types and variations in input data are required, and some types of input data are better known than others. If uncertainty exists with respect to certain classes of input data or attack strategies, separate runs of the model can be made to cover the spectrum of input possibilities. Under the controlled conditions of the model, these sensitivity studies will give the analyst a good feel for the quantitative effect of variation caused by input data uncertainty. Depending on the degree of effect in the final results, the analyst may or may not wish to expend additional effort improving the input data. One especially important type of improvement in input data is the potential de-aggregation of transportation network data. It will sometimes be found that most of the network aggregation is appropriate and realistic, but in certain localities, special cases cause an unusually heavy traffic load, and greater detail is desired to see what is happening. In such areas the secondary roads can be de-aggregated, more detailed data can be reentered through DAMSEL, and the degree of realism in the special locality can be improved without the necessity to rework the entire transportation network data base.

A variety of different attack strategies should be generally be used to determine which strategies appear most cost/effective in creating interdiction. LOGATAK is very helpful in developing superior interdiction strageties, as the traffic flows generated by the model show clearly how the logistic net responds to interdictive damage, and "avenues of escape" can be successively closed off.

One of the important benefits of interdictive attack is the reduction in the mobility of battle forces, as well as the more usual reduction in level of supplies. Many battles are won or lost by the degree of mobility in the battlefield military units, because a unit away from the main action is often of no more value than a unit which has been destroyed. In many scenarios, the movement of military units through the logistic support area competes for the use of these facilities with the movement of supplies, and unit moves must be accounted for in the model as they are often the heaviest user of logistic network capability.

It has been previously mentioned that the model will, from time to time, produce results of a very surprising nature to the analyst. The analyst should be especially sensitive to these situations, because the surprise is caused either by a serious inconsistency in the model which produces destructive unrealism in the simulation, or by a truly novel effect not present in the analyst's previous experience. These new effects are among the most valuable results produced by the exercise of the LOGATAK model, and they should be followed up and studied carefully as potential new improvements in interdiction.

CHAPTER VII
FORCE MOVEMENT OPTION

1. INTRODUCTION AND PURPOSE

The LOGATAK model has been developed for analyzing logistics networks before and after interdictive attack, as described in the previous chapters. Because forces moving to the front must compete with logistical traffic along the same transportation network, the LOGATAK model can be used to investigate mobilization and interdiction of reinforcements.

The Force Movement Option to LOGATAK provides the user with the ability to move units according to their organizational order of march from garrison locations in rear areas, up to pre-commitment locations. Units are provided with organic bridging and the ability to clear obstacles (landslides, mines) and perform these functions on an as need basis. To accommodate these requirements some additional input data is required. This takes the form of the division organization, the division movement, and organic bridging capability.

To improve the interdiction aspects of LOGATAK, the target set idea has been developed. Targetable entities along the transportation network are grouped into target sets. A number of attacks are performed against a set at once. Sets could consist of rail bridges, marshalling yards, etc. Those elements of a set already destroyed (and not yet repaired) will not be restruck during subsequent attacks. Targets can be in one or more sets at the same time.

Additionally, the ability to attrit units and create obstacles has also been included. Off-road movement around obstacles, reconstitution and wrecks have been included in the expanded attack module.

Every attempt to minimize additional computer requirements has been made. Much of the new data has been woven into the existing logistics network data to minimize restructuring of the model.

2. INPUT DATA FOR FORCE MOVEMENT

2.1 Unit Organizations

2.1.1 Supply Item Common Data

The smallest indivisible unit to be represented in the model is considered to be a supply item. Identification numbers one through eight are reserved for this purpose. The SICOM attributes have been expanded to include attrition effects for up to six weapon types (Table VII-1). This attrition is expressed as a percentage of a full strength unit destroyed per weapon application.

2.1.2 Parent Unit Organization

These component units are organized into parent units through the use of the ORGAN data card (Table VII-2). The order of march of the parent unit is represented by the matrix of organization. The items in the first set will move first, second set second, etc. Up to seven sets can be represented.

2.2 Parent Unit Movement

To ease the burden of data preparation, an entire parent unit consisting of as many as 504 items can be input for movement through LOGATAK using only one data card (Table VII-3). This module will construct shipments of each item, assign priorities, and begin movement through the transportation network. The LOGATAK departure time may differ from the actual departure time to include movement outside of the area of interest.

Movement priority is used by LOGATAK to resolve contention on link usage. Lowest numbers move first. The user should use the case of two units attempting to cross one bridge simultaneously to resolve movement priority problems.

3. INTERDICTION

Expanded interdiction capabilities have been included in the force movement option of LOGATAK. Mines, landslide areas and attrition of of units on the move have been included, as well as targeteering, intelligence, weaponeering, and limited strike assets.

TABLE VII-1. SICOM ATTRIBUTES FORCE MOVEMENT OPTION

SICOM (ITEM) - COMMON SUPPLY ITEM DATA
- ONE SET FOR EACH UNIT TYPE (ITEM IDENTIFICATION NUMBERS 1 THROUGH 8)
- USE CARD TYPE INITP3

ATTRIBUTE	DESCRIPTION
1	WEIGHT OF UNIT
4	ITEM TYPE CODE (1)
5	SOURCE OF ITEM IDENTIFICATION NUMBER (GENERALLY THE SAME AS SICOM ID NUMBER)
8	STATISTICAL INDICATOR FOR OVERALL WEAPON EFFECT (3)
9	INDEX TO ATTRITION DISTRIBUTION FOR WEAPON TYPE 1
10	STATISTICAL INDICATOR FOR ATTACK EFFECTIVENESS OF WEAPON TYPE 1 (3)
11	INDEX TO ATTRITION DISTRIBUTION FOR WEAPON TYPE 2
12	STATISTICAL INDICATOR FOR WEAPON TYPE 2 (3)

TABLE VII-2. PARENT UNIT ORGANIZATION DATA CARD FORMAT

COLUMN	FORMAT	DESCRIPTION
1-5	A5	CARD NAME (ORGAN)
6-7	I2	SEQUENCE NUMBER (ENTER 1)
8-10	I3	UNITED TYPE IDENTIFICATION
11-12	2X	
13	I1	NUMBER OF ITEM 1 UNITS
14	I1	" " " 2 "
15	I1	" " " 3 "
16	I1	" " " 4 "
17	I1	" " " 5 "
18	I1	" " " 6 "
19	I1	" " " 7 "
20	I1	" " " 8 "
21-22	2X	
23-30	8I1	REPEAT CC13 - CC20
31-80	5(8I1)	REPEAT 21 - 30 AS REQUIRED

TABLE VII-3. PARENT UNIT DIVISION DATA CARD FORMAT

COLUMN	FORMAT	DESCRIPTION
1-5	A5	CARD NAME (DIVSN)
6-7	I2	PRIMARY CARD (ENTER 1)
8-10	3X	
11-20	F10.0	TIME OF DEPARTURE IN LOGATAK
21-24	4X	
25-27	I3	ORIGIN TERMINAL
28-30	I3	DESTINATION TERMINAL
31-40	F10.0	TYPE OF PARENT UNIT
41-50	F10.0	ACTUAL DEPARTURE TIME
51-60	I10	UNIQUE DIVISION IDENTIFICATION NUMBER
61-65	5X	
66-68	I3	PRIORITY
69-80	12X	

3.1 Target Set Concept

Strikes are carried out against target sets. At present, only links and terminals are included in a set. Links and terminals are grouped by some analyst-defined rule, and strikes are carried out against these sets. This helps the analyst by reducing his burden on input preparation. Table VII-4 describes the input for target sets.

3.2 Basic Repair Groups

Targets are repaired in two ways: automatically some time after attack (simulating dedicated repair assets) and on demand (organic engineer capability). Mines are cleared by any units encountering this type of obstacle. Once struck, a target will be repaired in one of these two ways. Some parameters of the repair must be addressed. Table VII-5 lists the input format for the basic repair groups. A group could consist of pontoon bridges, track laying, mine clearing, etc.

3.3 Attack Execution

Because many more options for interdiction have been added to LOGATAK, a new attack module has been developed, with a wide variety of options (Table VII-6).

4. OTHER MODEL ADDITIONS

Additional exogenous events have been added to reflect the force movement option (Table VII-7). These include the additional input data requirements described above, and additional reporting features.

4.1 Queue Report

A list of all queues currently (at the time of the report) in existence are organized by terminal number, and the members of the queue.

4.2 Target Status Report

An abbreviated version of the transportation report, dealing only with elements of the network that are included in target sets.

4.3 Attack Effects Report

Upon attacking items in transit, LOGATAK keeps statistics on the effect of each type weapon on the attrition of the item. This report gives

TABLE VII-4. TARGET SET DATA CARD FORMAT

COLUMN	FORMAT	DESCRIPTION
1-5	A5	CARD NAME (ENTER RDAST)
6-7	I2	CARD NUMBER (ENTER 1)
8-10	3X	
11-15	I5	TARGET SET NUMBER (MAX. 100)
16-20	5X	
21-25	I5	TERMINAL NUMBER, LINK END POINT OR ZERO
26-30	I5	LINK NUMBER, LINK END POINT OR ZERO
31-40	F10.0	TARGET PROBABILITY OF DESTRUCTION (0. TO 1.)
41-50	I10	BASIC REPAIR GROUP IDENTIFICATION TYPE (NEGATIVE FOR REBUILD ON DEMAND, POSITIVE FOR AUTOMATIC REPAIR)
51-60	10X	
61-70	F10.0	LENGTH OF REPAIR OR INTERIM TERMINAL CAPACITY
71-78	8X	
79-80	F10.0	TARGET PRIORITY WITHIN SET

TABLE VII-5. BASIC REPAIR GROUP DATA CARD FORMAT

COLUMN	FORMAT	DESCRIPTION
1-5	A5	CARD NAME (ENTER RDBRG)
6-7	I2	CARD NAME (ENTER 1)
8-10	3X	
11-15	I5	GROUP TYPE NUMBER
16-20	I5	MATERIAL AVAILABILITY DELAY DISTRIBUTION INDEX
21-30	F10.0	RATE OF TRAVEL
31-40	F10.0	CAPACITY/DISTANCE
41-50	F10.0	CONSTRUCTION TIME DISTANCE/TIME
51-60	F10.0	PROBABILITY OF DESTRUCTION (0.0 TO 1.0)
61-80	20X	

TABLE VII-6. ATTACK TARGET SET DATA CARD FORMAT

COLUMN	FORMAT	DESCRIPTION
1-5	A5	CARD NAME (ENTER ATSET)
6-7	I2	CARD NUMBER (ENTER 1)
8-10	3X	
11-20	F10.0	TIME OF ATTACK
21-30	F10.0	TARGET SET NUMBER
31-36	I6	WEAPON TYPE NUMBER
37	I1	LINK PRIORITY (0 - AS IN TARGET SET 1 - LINKS IN USE ONLY 2 - LINKS IN USE FIRST)
38	I1	ATTRITABLE ITEM TYPES (0 - ALL 1 - ITEMS 1 THROUGH 8 2 - ITEMS 9 AND ABOVE)
39-40	I2	TYPE OF ATTACK (0,1,3,4,7,8,10,11 - LINKS, 0,5 - TERMINALS 2,6,7,8,12 - QUEUES 6,7 - UNITS MOVING 3,4,5 - MINES 10,11,12 - NUCLEAR)
41-46	I6	MINIMUM ATTACKABLE QUEUE SIZE
47-50	F4.0	WEAPON EFFECTIVENESS (0. TO 1.)
51-55	I5	MAXIMUM NUMBER OF WEAPONS PER TARGET

TABLE VII-6. ATTACK TARGET SET DATA CARD FORMAT (CONTINUED)

COLUMN	FORMAT	DESCRIPTION
56-60	I5	TOTAL NUMBER OF WEAPONS FOR THIS ATTACK
61-70	F10.0	PROBABILITY OF DESTRUCTION MULTIPLIER (NUCLEAR STRIKE) OR LENGTH OF MINE FIELD
71-80	F10.0	TIME DELAY (NUCLEAR AND MINES)

TABLE VII-7. ADDITIONAL ZINIT SUBNODES WHICH CAN BE SCHEDULED EXOGENOUSLY

SUBNODE NUMBER	PURPOSE
14	INTERIM QUEUE SUMMARY REPORT
15	INTERIM TARGET SET STATUS REPORT
16	DIVSN-INPUT PARENT UNIT MOVEMENT CARDS
17	ORGAN-INPUT FORCE ORGANIZATION
18	RDBRG-INPUT BASIC REPAIR GROUP DATA RDAST-INPUT TARGET SETS
19	ATSET-ATTACK A TARGET SET
20	ATRPT-ATTACK EFFECTIVENESS REPORT

the breakdown of the effectiveness of each weapon on each item and an aggregate for all weapons on each item.

5. OPERATING STRATEGY

The flexibility of the force movement option allows a wide range of scenarios to be generated quickly. Sensitivities to order of march, movement priority, and weapons effects can be played with minimal manpower expenditure.

Parent unit organization has some limitations. Only eight basic item types are allowed. Some aggregation of support elements may be required to accommodate this limit.

When the numbers of basic item types exceed nine in an organization, another movement set must be started. If more than seven movements sets are required by a parent organization (a tank division at company level, for example). Additional parent unit organizations may be added. Care must be taken to be sure that the parent unit movement is initiated by one unit of each type.

The attack target set options provide additional variety in the analysis than can be made. A well-structured, comprehensive plan of sensitivity excursions will ease the analyst's burden of option selection.

The supplemental reports used with the restart options allow war room simulations using LOGATAK. The reports represent the current network status (at the time of the report). Strikes against queues or links could be allocated (after an appropriate delay) and the run could be restarted with the new attacks included.

NOTE: The new LOGATAK data included in the force movement option is contained in PDS (Permanent Data Sets) storage and not in PERMAT as described in previous chapters. Care must be taken to include all PDS service routines and verbs when assembling LOGATAK for the first time, if the force movement option is to be used.

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